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**National Gas Engine
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Place:

Lakemont

Date:

[1916]

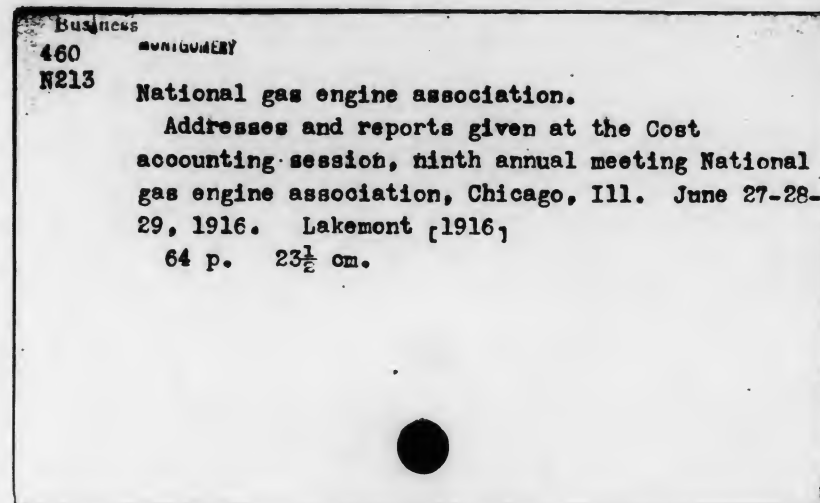
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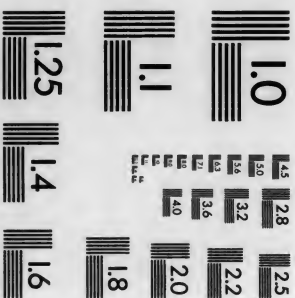
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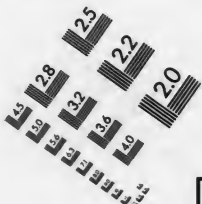
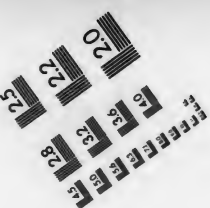
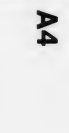
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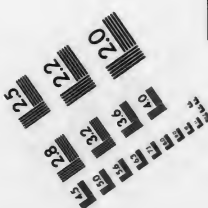
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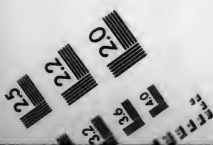
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ADDRESSES AND REPORTS

GIVEN AT THE

Cost Accounting Session

Ninth Annual Meeting

National Gas Engine Association

Chicago, Ill.

JUNE 27-28-29, 1916

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Issued to Members by the
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ASP 9.21/20

SCIENTIFIC FACTORY MANAGEMENT

By Joseph A. Bursley, Associate Professor Mechanical Engineering, University of Michigan.

Scientific Management is, as most of you probably know, a term that has been applied to the principles of industrial management correlated by Frederick W. Taylor. Mr. Taylor never claimed to have invented or discovered anything new. He simply collected into one complete and unified plan a number of ideas and principles, many of which have been in use for years. But he did more than that. He showed by years of painstaking experiments the great value of analysis and of knowing the exact facts in connection with the work being done.

Mr. George D. Babcock, of the H. H. Franklin Manufacturing Company in Syracuse, New York, who has done some remarkable work in the line of obtaining control of raw material and product passing through the shop, has defined scientific management as "that kind of management which conducts a business or affairs by standards established by facts or truths gained through systematic observation, experiment or reasoning." This states the case very clearly and concisely, the whole basis of scientific management being the idea of setting certain standards from data obtained by careful and systematic work and then running the business according to these standards.

Mr. Taylor outlined the principles of scientific management as being four in number.

"The first of these principles is the development of a science to replace the old rule-of-thumb knowledge of the workmen. In other words, the management deliberately gathers together the knowledge which is possessed by the various kinds of tradesmen in the plant, classifies it, tabulates it and reduces it to laws and rules. In many cases mathematical formulae are worked out which, when applied with the cooperation of the management to the work of the men, will lead to an enormous increase of the output of the workmen.

"The second principle is the scientific selection and then the progressive development of the workmen. The workman is studied so as to ascertain his possibilities, and then an effort is made to develop him so as to bring out his best faculties and to train him to do a better and more profitable class of work than he has done in the past.

"The third principle is that of bringing the scientifically selected workman and the science together.

"The fourth principle is a deliberate division of the work which was formerly done by the workmen into two sections, one of which

is handed over to the management. An immense mass of new duties which formerly belonged to the workmen is thus thrown on the management."

These four principles enunciated by Mr. Taylor form the basis of the work done in every plant working under real scientific management. I say this advisedly because I know there are many men installing, and many plants operating under so-called "scientific management," which have no relation to the scheme of management as laid down by Mr. Taylor. To those who believe in Mr. Taylor's ideas, however, the term scientific management really means the Taylor system of scientific management.

Starting, then, with the premise that these four basic principles must be followed in every plant adopting scientific management, too much emphasis can not be laid on the fact that the manner in which these principles are applied differ for every kind of business and, indeed, for each individual shop. In no two plants—no matter how similar they may be—can the details be carried out in exactly the same way, although they will, of course, be more nearly alike in two shops working in the same type of industry than in case the industries differ.

This brings us to the point I wish to make regarding the classification of industries for the purposes of management. This classification should be based on a similarity of processes, specifications and machinery, rather than on a similarity of raw material or product. This was emphasized quite strongly at the recent meeting of the Taylor Society in Ann Arbor by the types of industries grouped together in the round table discussions. For example, one discussion was of industries using "continuous processes with a uniform product with uniform specifications, using single purpose machines with uniform operations and with simple routing." In this group were found the textile and the paper pulp industries.

Another type is that class of industries using "non-continuous processes but with a uniform product with varying specifications, using single purpose machines with varying operations and with complex routing." This type includes plants manufacturing such products as books, clothing, boxes, envelopes, handkerchiefs and printed matter.

A third discussion included those industries using "non-continuous processes, with varying products with varying specifications, using multiple purpose machines with varying operations, and with complex routing." Such a type is illustrated by the machine shop.

One thing that it is extremely important for the owners and managers of any plant to remember in case they are considering the installation of scientific management is that results cannot be obtained in a minute. It will be a long pull and will take lots of patience, perseverance and hard work with everyone pulling together with one idea in mind. If any Aladdin's lamp results are expected, disappointment is sure to follow.

In case it is decided to go ahead, there are certain preparatory steps which must be taken whether the plant be a machine shop or a flour mill. The first of these is to obtain, if possible, a record of what has been done in the past so that after the new system has been started we may have something with which to compare the results obtained. In a large majority of shops it will be found that there is an almost total absence of records that are of any value. There has been no system of cost-keeping that really means anything. The chances are ten to one that all the management knows is that on the gross business in any one year there has been a profit or a loss but when it comes to the question as to which particular line of goods manufactured has shown a profit and which a loss, or why there is a loss, most concerns are absolutely at sea.

After obtaining such records of existing practice and conditions as we can, the next step will be a rearrangement of the plant so as to better utilize the space available and make possible more efficient and economical operation. This step must be very carefully thought out and all contingencies provided for as far as possible, before any actual changes are made. In order to minimize the confusion resulting during this reconstruction period, it is advisable not to try to do everything at once, but to proceed gradually with the changes, having a definite goal in mind, however, and making each step lead toward the final arrangement which we have previously planned out. In this connection, it is sometimes desirable to build a small model of the plant or simply lay out a drawing to scale, and then locate on each floor the various machines by pieces of cardboard cut to scale so that the floor space occupied by these pieces of cardboard bears the same proportion to the drawing or model as the actual space used by the machine bears to the building. After this has been done, the paths followed by the raw materials and manufactured products passing through the plant may be indicated by strings or ink lines of various colors. It will then be very easy to detect cross tracks, back paths, etc., and to remedy such devious courses by a rearrangement of our cardboard machines.

One of the first things to be decided in the rearrangement of the plant is the location of storeroom, tool room and planning room. In most cases, unless the plant is very large or the raw material of peculiar character, it is advisable to have all stores in one place. Such a plan will make control of the stores easier. If the store-room for finished product can be placed near the raw material storeroom, so much the better. The tool room and planning room should be as centrally located as possible so as to make them easily accessible to all employees.

The next step is to clean house. Nearly every plant which has been running any length of time has an accumulation of scrap and junk which, like Topsy, has "just growed" until it has become a fixture and it has been nobody's duty to dispose of it. This accumula-

tion of years should be gone over by someone familiar with the plant in question and the part worth keeping carefully separated from the rest. There will be a large amount of stuff which should be burned or sold as junk; in fact, this will probably be the case with most of it. What is kept should be immediately removed to the storeroom or tool room previously prepared to receive this material. Thousands of dollars worth of tools and stores are thus scattered around in many shops and the management absolutely does not know what it has. There will probably be opposition on the part of the workmen when this cleaning up process takes place, as each one has carefully collected a set of the tools which he uses most frequently and he feels that he has a sort of proprietary claim on them and he objects to having them returned to a central tool room where they will be accessible to everyone.

While the house cleaning is going on, the various machines and work places should be classified and numbered. This will tend toward simplification in future work as any given machine can be much more easily and definitely referred to if it is identified by a certain number or symbol.

As an example of this might be mentioned the classification of machine tools used by one machine shop with which I am familiar and which has been working under scientific management for about four years.

Classification of Machine Tools.

- A—
- B—Boring Mills.
 - B H—Horizontal.
 - B V—Vertical.
- C—Cutting off Machines.
 - C C—Circular Cold Saws.
 - C H—Power Hack Saws.
- D—Drill Presses.
 - D C—Center Drilling Machines.
 - D M—Multiple Spindle.

If desired, the number of spindles may be given in symbol, thus:

- D 2 M=2 Spindle Press.
- D P—Plain Drill Press.
- D R—Radial Drill Press.
- D S—Sensitive Drill.
- D T—Tapping Machine.

- E—
- F—Punches and Presses.
 - F A—Arbor Presses.
 - F P—Punches.
 - F S—Stamping Presses.

- G—Grinders.
 - G B—Belt Grinders.
 - G C—Cutler Grinders.

- G D—Drill Grinders.
- G P—Plain Grinders. Including Polishing Machines.
- G S—Surface Grinders.
- G T—Tool Grinders. (Lathe and Planer Tools)
- G U—Universal Grinders, and Plain Grinders for Cylindrical Work, rotated on centers.
- G X—Special Grinders.

H—Furnaces and Forges.

J—

K—Keyseaters.

L—Lathes.

- L A—Automatics.
- L C—Chucking Lathes.
- L E—Engine Lathes.
- L S—Speed Lathes.
- L T—Turret Lathes and Screw Machines.

M—Milling Machines.

- M P—Plain. (Horizontal.)
- M U—Universal. (Horizontal.)
- M V—Vertical. (Horizontal.)
- M X—Special. (Horizontal.)

P—Planers and Shapers.

- P P—Planers.
- P S—Shapers.

R—Gear Cutters.

- R P—Gear Planers or Shapers.
- R R—Rotary Gear Cutters. (Milling.)

S—Slotters.

T—

U—

V—Vice Benches.

W—Wood Working Machines.

X—Miscellaneous Machines not otherwise classified.

Y—

Z—

One of the most important of the preliminary steps is the selection of the men who are to assist in the development of the system and are to fill the new positions that will be created by the system. Great care should be taken in the selection of these men, for success or failure may depend upon your organization. A loyal, enthusiastic personnel working with you and not for you will be of immensely greater value than any other part of your business. Buildings and machinery may be obtained in a short time, but a successful organization takes years to build up, and we must be sure that we select the right stock before we begin our training.

The men to be selected at the start are: the man to have general charge of the development of the system under the direction of your

consulting engineer, the man to have charge of the stores, and the man to have charge of the tool room. Later on, you will need others, such as a production clerk, a routing clerk, a man to take time studies, a balance of stores clerk, and others.

Among the preliminary steps, that of installing a proper stores system is one of the most important. Until that has been done, proper routing is impossible and no accurate accounting can be done. It is important to remember, and it should be impressed upon all employees, that stores are simply **another form of money** and that it is just as necessary and vital to the financial success of the business to have a correct and accurate control and record of stores as it is of the cash drawer. I can't impress this on you any too strongly. Stores are simply a form of money, that is all. You put your money in the storeroom instead of keeping it in the cash drawer, and there is no more reason why the storeroom should be open so that anyone or everyone can go in there and take out material when he pleases, than there is that anybody should have the right to put his hand in the cash drawer and take out what money he wants.

The man in charge of the development of the stores system should see to it that proper and a sufficient number of racks or bins are provided in the storeroom and should then begin on a stores classification. (Describe bins.) In scientific management, the mnemonic system is used in all classification whether it be of scores, tools, machines, and work places, manufactured product, ledger accounts or customers.

In this system of classification, I, O, Q, and U are omitted; I and O because they might become confused with the figures one and zero, Q because it might be mistaken for zero, and U because of the danger of mistaking it for J or V if hurriedly written. Of the other letters, A, B, and C are used to indicate general expense accounts, such as auxiliary departments, business selling and business expense; D stands for manufacturing department charges; E, experimental account; F to W inclusive, omitting S, manufactured products; X, Y, and Z, ledger accounts, such as fixtures and tools, and machinery and shafting. S is always used to indicate stores, or material bought outside and on which no work has been done in the plant. These classes are again subdivided and re-subdivided several times until finally the complete symbol is arrived at. (Example—University storehouse.)

Another classification which may perhaps be of even more particular interest is that of small tools. This classification is the one used in the machine shop referred to before.

A—Abraiding tools—All tools used for filing, grinding, polishing, rubbing, scratching, scraping, shearing, etc.

B—Blanking tools—All tools used for blanking, perforating, cutting off, etc.

C—Clamps and holding devices of all kinds including bolts and screws.

D—Drilling and boring tools that remove metal from the interior.

H—Hammers and all tools that work by striking or being struck.
J—Jigs, dies (except blanking) and all instruments for duplicating work including templates and fixtures.

M—Measuring instruments of precision.

P—Faring tools—All tools that remove metal from the surface by cutting.

R—Rotary cutting tools.

T—Transportation tools.

W—Wrenches and hand tools which cause rotation.

X—

Z—Special tools.

Now let us follow through the various subdivisions of one of these classes:

D—Drilling and boring tools, for examples:

DB—Boring bars.

DC—Cutters for boring bars.

D—Drills.

H—Holding devices for class D tools.

K—Counterbores.

L—Lathe boring tools.

P—Portable drills.

R—Reamers.

T—Taps.

V—Countersinks, centering tools.

Z—Special boring tools.

Next take DD—Drills.

DDB—Bottoming drills.

DDC—Combination drills.

F—Flat drills.

H—Hog drills.

L—Shell drills.

M—Three-lipped drills.

N—Four-lipped drills.

S—Straight-away drills.

T—Twist drills (regular two-lipped).

Z—Special group.

Then follow the subdivisions of DDT—Twist drills:

DDTL—Oil twist drills.

DDTP—Extension twist drills.

R—Ratchet twist drills.

S—Straight shank twist drills.

T—Taper shank twist drills.

And finally we have the subdivisions of DDTT—Taper shank twist drills:

DDTTC—Carbon steel.

DDTTH—High speed steel.

L—Oil grooved.

X—Extension shank.

With such a classification as this once established it is a very simple matter to definitely specify any particular tool. For instance, DDTTC $\frac{1}{2}$ means a $\frac{1}{2}$ -inch taper shank twist drill of high speed steel, and so any other tool can be easily and accurately identified.

In case it is found possible to do so, the racks and bins in the storeroom should be arranged in alphabetical order, so that the symbol will not only serve to identify the particular article, but will also serve as a guide to its location. In many instances, it will not be found possible to arrange the articles according to their symbols, and under these circumstances it will be found necessary to have location symbols in addition. The first letter of such a system of location symbols might represent the building, the second the floor, and the third the particular row, starting to count from some previously determined corner.

At the same time that the stores classification is being worked up, balance sheets should be made out for every article carried in stores. These sheets should have entered on them the name of the article, the symbol, and the maximum and minimum quantities to be carried. They should also be provided with columns in which will be shown the amounts ordered but not yet received, on hand in the storeroom, apportioned to orders but not yet issued, and available, i. e., ordered or on hand, but unapportioned.

It may perhaps be well to explain a little more definitely just what we mean by the terms maximum and minimum quantities as used here. The maximum quantity is the amount to be ordered when the quantity available falls to a certain predetermined minimum. This minimum should be set by someone familiar with the requirements of the business, and will be determined by the frequency or rapidity with which the article is used and the length of time that it takes to get a fresh supply.

The maximum quantity or amount to be ordered will be determined by the size of orders most economical to buy, the storage space available, the frequency of price fluctuations and the amount of capital that the management is willing to tie up in stores.

Such a stores system as here laid out will, if properly operated, provide the management with a perpetual inventory of material on hand, and make unnecessary the annual "taking account of stock."

Under scientific management, the year is divided for purposes of accounting into thirteen periods of four weeks each, instead of twelve monthly periods. This gives a much fairer comparison of results as each period contains the same number of working days.

In order to obtain proper control of production certain essential features are necessary. Among these are an adequate stores system such as has been referred to and a carefully worked out plan of purchasing raw material. This plan should be based on a thorough study of the requirements, and upon a determined effort to standardize both the purchased material and the manufactured product so far as pos-

sible. After this standardization has been carried out and the requirements accurately known, standard specifications should be drawn up, and all bids should be subject to these operations.

Another feature necessary for production control is an analysis of the various jobs throughout the plant. This analysis is based upon a careful time study of the elements of each job, and also of the conditions under which the work is done, the effect upon the employee of the particular work which he is doing, the proper number and length of rest periods to be provided for, and the allowance to make for fatigue. All of this requires the most careful study and judgment, and too much care cannot be taken in the selection of the man who is to make the time studies. In addition to having an analytical turn of mind he should be thoroughly familiar with the jobs which he is studying, so that he can detect any attempt at soldiering on the part of the man being studied, and at the same time he should have the confidence of the employees so that they will not think, to use a vulgar expression, that he is trying to "put something over on them."

This job analysis and time study leads to many important savings in time and money, and often serves as a means of shifting square pegs out of the round holes into which they have been pushed by Fate, into square holes where they fit. After a job has been analyzed and the time set in which it is to be done, it will often be found that some of the employees who have been doing this particular kind of work are absolutely unable to do it in the time allowed. On the other hand, others will do it easily. The first class are evidently the square pegs above referred to and should be transferred to other work. This shifting may take several times before the right niche is found for all, but it is indeed a rare case for which a square hole cannot be found if enough time and patience is used, and when these employees have finally found themselves, all the effort expended in helping them to land on their feet will be well repaid by the increased zest with which they tackle their jobs.

As a simple illustration of the savings possible with proper job analysis I want to mention the following case.

In a shop (not running under scientific management), manufacturing automobile windshields one of the operations consisted in turning and threading certain small brackets. Part of these were turned on a two-spindle bar machine and threaded on another machine, while others were both turned and threaded on a turret lathe. The management wished to know which of these two ways was better, that is which way the cost per piece was cheaper. An analysis and time study of both operations showed the following:

The setting up time for the two-spindle machine was 46.33 minutes, while that on the turret lathe was 84.33 minutes. A study of the data however, revealed the fact that at least 32.46 minutes or nearly 40% of the latter time might have been saved by proper planning and without the slightest change whatever in the method of operation or

in speed of operator. The items going to make up this lost time were:

1. Getting wrench and parts for new set-up	1.08 min.
2. Getting a hammer95 min.
3. Cleaning bearing on fixture	4.14 min.
4. Cleaning oil grooves in rest	1.68 min.
5. Getting tin snips and cutting liners	1.64 min.
6. Recutting thread on fixture stud	3.58 min.
7. Grinding clamp to fit73 min.
8. Making shim to put back of stock90 min.
9. Hunting for file to clean die cutters77 min.
10. Cleaning dies with file61 min.
11. Cleaning dies with rag	1.45 min.
12. Getting new dies	1.32 min.
13. Tying up feed handle with block and rope	2.02 min.
14. Getting thread gauge	11.59 min.
Total	32.46 min.

The psychological effect of conditions which permit and even necessitate such a loss of time are extremely bad. No workman will do his best when he finds it necessary to spend 10 to 15 minutes looking for tools and then 15 to 20 minutes more cleaning a dirty machine, and getting it in such shape that he can do any work on it by cutting shims, cutting new threads on fixture studs and tying the machine up so that it will run.

The machine should have been clean, and in good repair, and all the necessary tools and liners should have been at the machine ready to be used.

When this 32.46 min. is subtracted from the total setting up time on the turret lathe, 84.33 minutes, it leaves 51.87 minutes as compared with 46.43 minutes on the bolt cutter.

Now let us compare the actual machine and handling times. The total time per piece on the bolt cutter was 1.44 minutes per piece as against .93 minutes on the turret lathe, and this is on the basis of both spindles on the bolt cutter being operated simultaneously. At this rate it does not take long for the turret lathe to overcome the slight advantage in setting up time held by the bolt cutter.

The fact that the bolt cutter was not running anywhere near its proper speed will be seen by comparing the actual cutting times.

The time required to turn one end (47-64" in diameter and 2 1/4" run) was 1.51 minutes on the bolt cutter and only .19 minutes on the turret lathe.

I have gone into this example rather in detail in order to show how much valuable information may be obtained from a simple analysis of the job. One other case which I wish to cite shows the results accomplished in a plant manufacturing paper boxes. The particular problem which I will describe relates to the so-called wrapping machines. (Describe machine briefly.) The machines are operated by a

crew of three girls, the operator who runs the machine, the gluer who puts the glue on the wrappers, and the inspector who inspects and piles the finished boxes.

As the theoretical maximum production on a wrapping machine would be obtained if the machine was kept running continuously and a good box was produced for each stroke made, the problem before us was to establish such conditions as to enable us to approach this theoretical figure as nearly as possible.

There was no object in running the machine faster than the operator was able to feed it. Neither would it have been economical to have run it so slowly that the operator would have had to wait for the machine. The practice had been to run the machines 18 strokes per minute, and at first no change was made in this speed, although a little later it was found that better results were obtained by running 19 strokes per minute. The speed having been decided upon the next two points to which attention was given were:

1. Elimination of all avoidable delays and reducing to a minimum the duration of all unavoidable ones, thus increasing the running time of the machine.

2. Arranging the machine and the location of the material to be worked upon so as to enable the operator to work with the least possible fatigue, thus increasing the percentage of good boxes produced to strokes made by the machine.

To obtain the information necessary to accomplish the first of these results, observations were made showing the causes and duration of all delays on one machine. These observations continued for between three and four weeks, and showed that it was necessary to allow about five minutes per hour or twenty minutes per half day of four hours for unavoidable delays. This meant that the machine could be kept running fifty-five minutes out of every hour, or approximately 90% of the time.

In order to reduce to a minimum the fatigue of the operator the machine was changed so as to permit of the raw material being located more conveniently for her, and so as to lessen the strain on the eyes. After the installation of these changes, observations showed that the operator was able to catch 17 out of every 18, or nearly 95% of the strokes made by the machine when it was running 18 strokes per minute.

The next point considered was the percentage to allow for spoiled work, and after observing for some time it was determined that it would be safe to assume an allowance of 5 per cent.

After these three allowances had been determined, viz. 10 per cent. for delays, 5 per cent. for strokes missed and 5 per cent. for spoiled work, the "task" or number of good boxes to be produced per minute was computed to be $.90 \times .95 \times .95 = 81$ per cent. of the strokes possible for the machine to make, or 81 per cent. of 18, which gives approximately 15.5 boxes per minute or 870 boxes per hour.

In other words, it was computed that the machine would run 90 per cent. of the time, the operator would catch 95 per cent. of the strokes made by the machine while it was running, and 95 per cent. of the strokes caught would produce good work.

This was the basis on which the tasks were set and the first machine was started on task and bonus about the last of January, 1915, and the last of the six machines about a month later. At the same time the working period was reduced from 10 to 8 hours per day.

Before the installation of scientific management the method of pay had been first on a time work, and then on a piece work basis. Under the first condition the average number of pieces turned out per machine per hour had been 379 and under the second 435.

On July 1, 1915, or five months after the first of these machines was started under the new system a report was made to the management which showed that the average production per machine per hour had increased from 431 for the period from December, 1912, to July, 1913, to 598 for the period from March to June, 1915. The week ending July 3d showed an average production of 695 pieces per machine per hour, or 7,300 pieces per machine per week more than were being produced prior to the establishment of scientific management, or an increase of 31½ per cent. On the six machines this meant an increase of nearly 44,000 boxes per week, while at the same time the working time had been decreased from 54 to 44 hours per week or 18¼ per cent.

The report also showed the difference between the time allowed for over thirteen hundred jobs during this period of nearly 2,000 working hours, and the time actually taken was less than three quarters of an hour. This should be a fairly convincing argument that the time set was fair both to the employee and the company.

These results were obtained despite the fact that during this period business was slack and the planning room could not work to best advantage due to the scarcity and small size of the orders.

With the better business conditions which began to prevail last fall, the increase in production became more marked. The working hours were increased from 8 to 9 with a ten minute recess or rest period in the middle of the morning and another in the afternoon.

At the present time the production is 136 per cent. more than it was a year ago, and this is being accomplished with a 40 per cent. increase in payroll (direct and indirect), and at the same time the cost of boxes has dropped over 40 per cent.

While at first the girls were suspicious, and did not want to change from piece work to task and bonus, now they are perfectly satisfied and do not want to change back, as they are working less hours and at the same time making more money.

Nearly all of this change has been due to the time study and analysis of conditions which provided the data on which to base proper routing of material and elimination of delays.

Functional foremanship as opposed to the old type of one man foremanship is another principle upon which our production control depends. This is necessary in order to train the workman so that he may operate efficiently under the system. In place of one foreman we have eight—four in the shop and four in the planning room.

The shop foremen are as follows:

"The gang boss who has charge of the preparation of the work up to the time that it is set in the machine. It is his duty to see that every man under him has at all times at least one job ahead, together with the necessary drawings, jigs, etc., ready to go into the machine as soon as he finishes the job on which he is working. The gang boss must show his men how to set their work in the quickest time and then see that they do it. He acts as an instructor and must be ready at all times to assist his men in the accomplishment of their set task.

"The speed boss must see that the proper tools are used for the work that the machines are run at the proper speed and feed. He takes charge of the work after the piece has been set in the machine. It must be understood that his duties have nothing to do with the speed at which the men work, but simply with that at which the machines run.

"The inspector, as his name indicates, is responsible for the quality of the work.

"The repair boss sees that each workman keeps his machine clean and that he oils and treats it properly, and that the standards established for the care and maintenance of the machines and their accessories are rigidly maintained."

The four functional foremen in the planning room are:

(1) The order of work clerk who determines **when** the job is to be done, that is, the order in which jobs are to be given preference.

(2) The route clerk who says **where**, that is, on which machines the work is to be done.

(3) The instruction clerk who says **how** the job is to be done.

(4) The employment manager or director of personnel who, as his name indicates, has entire charge of hiring, promotion, discipline, and, as a final resort, discharge of employees. He of course works in close touch with the heads of departments and the various foremen, but the actual contact with the workmen is all through him.

As shown in the case of the wrapping machines, proper planning and routing of work through the shop will be responsible for a larger increase in production than any other one item. The productivity of the workman is increased not so much because he works faster or harder as it is because by proper routing delays in waiting for material, etc., are eliminated or largely reduced and he is able to work more continuously. He does not have to waste time standing around waiting for something to do.

The particular method of pay used is really of minor significance so far as results are obtained, although unfortunately, it has been magnified in importance by those opposed to scientific management. If the men feel that they are getting a square deal, and the production is under proper control, the tasks will be accomplished and the work turned out whether the pay is based on a piece rate system, task and bonus, premium system or any other. Control of material and confidence of employee are the keys to increased productivity.

One other point to be emphasized in this connection is this: if you are using any kind of bonus or premium system in your method of payment, the sooner the men can be given the bonus after it is earned, the better it will be. If a man is going to get his bonus the next day or at the end of the week, he will work for it but if it is not going to come until the end of the month or until the end of the year, he forgets about it and loses interest—he does not care anything about it. He wants his reward as soon as possible after it has been earned, and if he gets it at the end of each week—that is if he is paid weekly—or semi-monthly, he will remember the bonus long enough so that he will work for it the next time. In most shops working under this system every man is sent a ticket each morning informing him what his earnings were for the previous day. That is, in case he is working on a bonus system or a premium system or a differential piece rate, or something of that kind, send him a card each day so that he may know just what his earnings have been on the previous day.

The problem of the personnel is becoming more and more prominent as we are beginning to realize the great importance of the human element in management. These problems mean increased duties for the employment manager so that instead of being a disciplinarian whose principal duty was to "hire or fire," he has grown in dignity to be the director of personnel, responsible for the moral and physical well being of the men and women under him, for their health, wealth, and prosperity, so to speak.

If the principles and methods of scientific management as I have tried to outline them could be clearly understood, I feel sure that the attacks made on this system by agitators of one kind and another, most of whom are insincere in their statements, would utterly fail. The stop watch and bonus method of payment are simply means to an end and not the end itself. They are simply instruments by means of which we are endeavoring to set fair standards according to which we desire to conduct our business,—standards which are fair to all, employer, employee, and the public.

Discussion

The President: We would like a short discussion on that paper, if any of the members desire to ask the professor any questions.

Mr. Stritmatter: I would like to ask the professor one question, and that is: How long it would take to establish such a system as he has described.

Prof. Bursley: Well, it will take, I should say, two years to establish it in a big plant. You would have to do it slowly so as to avoid disarranging your present system. For example, you can put in one section in a short time, but it takes time for your employees to become accustomed to it, so that they can work out their part of it. They are always suspicious that you are trying to put something over them when any new system is introduced, and therefore it takes time to bring any new system into use, but after they become accustomed to it and see that it does not work disadvantageously to their interests, they take an interest in it and it works satisfactorily. But it takes time to bring it in, and it would in some large manufactories take years to successfully introduce it.

Mr. Stritmatter: In other words, the manufacturers would have to put out their money in order to install the system and wait for years before they would get any return for it.

Prof. Bursley: Yes, that is so, but it is possible that if you put it in gradually the men would become accustomed to it, and your returns from the investment would be ample and speedy. The firm I spoke of in my paper had a very discouraging experience at first, because just about the time they would have had a return for their investment there was a slump in business, in fact they did not have any business, but they stuck to it, and last year they had more than ever before and were enabled to do vastly more work and more economically than ever before. In an automobile factory I could name this system was introduced very successfully, and the manager told me they not only had largely increased their output, but that the amount of money they had saved in the purchase of tools and stores, notwithstanding they had decreased the purchase price of their cars 30 per cent., together with the increased output, had enabled the company to declare a very satisfactory dividend.

Mr. Roberts: I would like to ask the professor how the adoption of the system into a factory can increase the production?

Prof. Bursley: By saving the time of the employees in carrying on their work, and also in saving the wastage which invariably occurs without such a system, and, we have found that the increased production alone has been greater than the proportion of the cost of installing the system.

Mr. Bolens: If you are not to get the benefit of that system for such a length of time, what is the use of introducing it at all? When everything is prosperous and business is rushing we all know there is more or less wastage and the men will soldier on you, and they all do, but what troubles me the most is, how can we stand up in dull times? We want to know the economies that will result from it, and the length of time that will elapse before we can see the benefit that will

accrue from it, before we would go to any great expense on it. My idea is to make my engine the best that can be made in any manufactory, and in dull times it is better to have a man around who is a jack-of-all-trades, who can go from one machine to another and do any job, than to keep a lot of men around there because at some future time, when things get better, you may need them. It is all very well for those who have American workmen, but we have a lot of blamed things to contend with in our shops that you never dreamed of. I remember at one time we had a lot of Russians, whom nobody we had could understand, and they themselves spoke so many different dialects that they could not understand each other; then also we had a lot of Lithuanians that no one else in our employ could understand and they could not understand each other a great part of the time, and how are you going to get them to understand any such system? We had to get someone who could translate what they said and we said, and then we had cards printed in their languages and nailed up on the wall, but we found we needed a card with a different language nearly every fifteen inches. We were running seven molders, and they all spoke a different language, and what can you do with that state of things?

Prof. Bursley: I am afraid our friend who has just spoken has a hard time of it in understanding his men, and in teaching them just what he wants and how he wants it done, and that to my mind speaks more for the necessity of a system being introduced in his manufactory than anything I can say. My experience is that just as soon as the men understand the system they become interested in it, and a great saving in the economic running of the factory begins. If you find you can afford to pay big money for a general manager, it is better to take a man from your own plant and put him in that position than to take anyone you can get from the outside, because he is familiar with the work and understands it, and above all is interested in the plant. If you take that class of man, the presumption is that he will work harder in your interests than a stranger, and I believe it is always better to take your own men and bring them up as you want them.

Mr. Bolens: Scientific systems and science itself as applied to our business may be all very well, and I have no doubt that in many cases it is good, but I prefer the man with good, sound, practical experience, and they are very hard to get. I have known instances where scientific men in a big manufactory have said a certain thing could not be done, and at the same time a practical foreman who understood his business said it could be done, and went ahead and did it, but with all your systems, there is none that I ever saw which will prevent men soldiering on you and loafing if they have a chance.

Mr. Fisher: I know there has been great opposition on the part of the workmen in our state to the introduction of such systems.

Prof. Bursley: I know there has been great opposition offered, largely backed by the labor organizations, who somehow feel that sci-

entific management is another tool in the hands of the employer, and they do not feel exactly comfortable if they have a scientific manager, on the ground that he is going to drive the workmen and in increasing the output drive the machinery at greater speed. But just as soon as they become educated to the system and understand it, they find that it is not so, but on the contrary the very time saved by the men in their work, owing to no time being wasted looking here and there to find things which under the system at their hands automatically increases the output without any additional effort on the part of the men. They feel that the management can get all this information accurately and know the exact time it takes to do a job, and as soon as the job they have in hand is finished, there is another ready for them to go at, and no time is wasted. I do not think that opposition is fostered except by the labor organizations, and my experience is that it is growing less instead of greater. There has been a great deal of agitation in congress in order to prevent what they term stop-watch operations in our system of business on government work, but that is dying out, and although several bills were introduced I do not think there is a likelihood of any being passed.

Mr. Menges: Speaking of engine building in particular, I know great opposition was manifested by the workmen because they introduced a scientific system into the shops, and in ship building the labor organizations carried the matter to congress, and the systems met with great opposition there. I think you will find that you have greater opposition to scientific management or manufactories than you think, and I would suggest the greatest amount of caution in what you do.

Prof. Bursley: I agree with you that it must be watched carefully, but you will find that the men who work under scientific management are the best off after they become familiar with it. At the Watertown Arsenal there was a petition filed by the men asking an investigation of the operation of the stop-watch system in the work. An investigation was made to discover how much pressure had been brought to bear to induce the men to sign the petition, and after it had been abolished there was another petition, signed by the same men, to have it put back again, showing that the men did not know what they were asking for in the first petition. There is no doubt that the benefits of such a system are becoming so apparent that its introduction is steadily growing, and it will grow more and more as the men understand it, and in time every manufacturer for his own protection will be driven to use it, not that he can do so in a day or a week, but what he can do in the majority of cases is to introduce it gradually into department after department, as soon as the departments in which it is introduced, understand it. Its operation is to save the time of the men and to save waste in every department, so that the men can produce more rapidly their work, and that means more satisfactory work for the men, and a great saving of money to the manufacturer.

Mr. Bolens: I would like to ask where the foreman is going to be in this system? Isn't it his duty to see that the shops are kept up at the highest efficiency? In a large shop why not have an additional general foreman? Why isn't it sufficient to place the responsibility with the shop foreman? It seems to me that under this system we will invite a difficulty between the foreman and the clerks.

Prof. Bursley: No they do not, they interlock. It is like the teachers in the ward school and the high school; in the ward school you have a teacher for those who are in the school, whereas in the high school you have a teacher for everything.

Mr. Ward: Prof. Bursley has brought to our attention things relative to the scientific management of our shops which ordinarily would not be brought, and for one I thank him for his very interesting address, as it has given me and others food for serious thought. If you have a scientifically managed shop and can make twenty horse-power crank shaft, there is no good reason with proper organization, as the professor shows and can show your men; why they cannot make six horse-power crank shafts on the same machine, and they can do it just as easily as they can make a twenty horse-power crank—there is no good reason why you should not do it. We all admit that the information the professor has given us in regard to the scientific management of a large institution is of great value; it seems to me that it is a beautiful system—a system that stands away ahead and above Brother Bolens' ideas, and not the least interesting part of it is he told Brother Bolens that his system could be successfully introduced into a small shop as into a big one, but in the smaller shops he will not get the same result proportionally that he will in a larger one, because in the smaller shop the diversity of nuts and screws can be handled by one man, and in one of the larger shops that cannot be done. The present management of the Cushman Company took hold of the plant in 1909, when it was running an old shop and had twenty or twenty-one men. When I took the management of the plant I went down to the old plant, and the first thing I did was to have a sale. There was the old firm which had busted, and they did not have any stock to amount to anything; did not have any tools or money to buy any steel with. I started to clean up the shop and to take inventory of the tools and lathes, and in one corner of the shop we dug out and inventoried between \$500 and \$600 worth of tool steel which had been thrown aside, and they complained that they had not any steel in the shop at that time. The first overhead expense I put in was a tool man and tool inspector. You may possibly believe that that was unnecessary, but they more than earn their money by the care and the economy they exercise in the use of those tools. Soon after we started in and ran from fifty to sixty men in the first year, and I employed a speed boss, a gang boss, a repair boss and a straight tool man. I put fairly good stress on that, and I agreed with a fellow who had a small shop of his own, where he had two or three hours' work a day, and he took

those extra duties in a reasonably satisfactory way, and that rendered possible the next step that I took. As soon as I had a head man there, I took in the next unit. Just one other illustration. We started to manufacture engines. The men were paid at the rate of something like three and one-half dollars a day, and the average time was fourteen hours, and those fellows lapped over each other to get a view of a sample engine I was making. Our first attempt at introducing a system proved unsatisfactory, and I started a system of reducing the hours of work down to ten hours a day, and gradually increased that sliding scale down to six hours. We adopted a system of revision each year for the purpose of improving our production and our system, and subsequently we had a better inspection of the men and their work, the result of which was an increase in our output of from thirty-two to sixty per cent., and you gentlemen can understand pretty well what that meant, and right in that connection if Mr. Bolens, or anyone else, has any doubt about it, he can stop at the Cushman shop and I will give him free access to every man working under the efficiency system, and if he does not find, that notwithstanding the increased output our men are not better satisfied than under the old system, then I would revert my judgment as to the advisability of an efficiency system in any manufactory.

The President: I am afraid we have taken all the time we can give to this subject, but I will say that I had the pleasure of attending the Ann Arbor Conference and derived a great deal of information from my visit. I will quote a few fragments of the knowledge which I obtained at that conference and which bear out the views of Professor Bursley. It does not mean that we are going to change at once to this scientific plan, but it does mean to set us thinking if we cannot improve our methods of doing our work, and if we can then I take it we are all going to do so. We can introduce a system gradually from the knowledge we have obtained. I have to thank Mr. Ward for the concrete plan he has given you of the way he changed the system at the Cushman shop.

I now have the pleasure of introducing Mr. Clinton H. Scovell, of Boston, Mass., who will address us.

HOW CAN THE MANUFACTURERS OF THE NATIONAL GAS ENGINE ASSOCIATION WORK TOGETHER TO OBTAIN UNIFORM METHODS OF FIGURING COSTS

By

Clinton H. Scovell, Certified Public Accountant

The address you have just listened to, or any other exposition of scientific management, is essentially a program to be applied in an individual plant. It was valuable to you in its presentation of suggestions which you can make effective in your own establishments.

What I have to present, on the contrary, is a program for common effort among the members of your association—"How can the manufacturers of the Gas Engine Association work together to obtain uniform methods of figuring costs?"

This discussion is most thoroughly in accord with the program of industrial preparedness which is receiving the attention of business men and manufacturers at the present time, and with the repeated recommendations of the Federal Trade Commission that members of associations should unite to develop common plans for getting better accounting methods into their common business.

In undertaking work of this kind it is not only essential that plans should be made for uniform methods, so far as that is possible among members of the association, but it is of the utmost importance that any accounting plans laid out for an association should be based upon correct principles. It has sometimes been said, very wrongly, I believe, that it is more important to have the accounting exactly alike for all manufacturing plants of an association than it is to have it absolutely correct.

The fallacy of this statement appears when we consider two important facts: first, that some members of the association will sooner or later find out what is correct accounting for their business, and naturally prefer that to uniformity; the second, what is probably of even greater practical importance, there will be a good many manufacturers who are entirely outside of the association, whose accounting will be neither uniform with the association nor correct in principle, so that they may be expected to go on with the unintelligent competition which has menaced the industry in the past.

Unintelligent Competition

The only assured protection against competition of this kind, and in fact the main object of association work in regard to accounting, is to get the facts—prompt and dependable information in each establishment—so that more and more manufacturers will know accurately what their product costs, and accordingly will know what they can afford to sell it for.

It is highly important that every manufacturer should clearly understand how correct cost accounting, both in his own establishment and in the plants of his competitors, will help to improve com-

petitive conditions, and therefore secure better profits in the industry. The regrettable fact is that in too many cases manufacturers argue that if another man can afford to sell a given article at a given price, they can also afford to make it and sell it at the same price. All too frequently men will reason in this way in regard to competitors without realizing that these competing plants may have no adequate cost methods, so that not even the owners themselves know whether they can afford to sell the article in question at the price that is named.

Even if the comparison is intelligently made with a well organized plant, it may still be true that differences of product and location, of regularity of production, or some other consideration, will justify a price that is not reasonable under the conditions with which it is compared. A man who is willing to be guided by his competitors' prices should not only make sure that the other plant is a well informed leader, but also that his own conditions are sufficiently like those of his competitors or can be made sufficiently like them, to make it safe to follow his lead.

In your own industry, some of the manufacturers undoubtedly feel that the price of your product is kept down by the unintelligent competition from manufacturers who are not making money, primarily because they are selling their products at less than cost to manufacture. This may be due chiefly to different methods of figuring, so that the manufacturer of whom you complain may be thinking of you as a price cutter on some other item, or these competitors may be making money on other items in their line, or they may be slowly drifting towards bankruptcy, hoping that an increasing volume, or better market conditions, will save them ultimate failure, whereas what is really necessary is an adequate knowledge of their own business.

Emphasis on Principles

This association is very fortunate in having such an active cost committee. It certainly deserves your cordial and unanimous support. The report which the chairman has just presented, you will remember, was concerned almost entirely with securing an agreement as to principles of cost accounting which should be observed in your industry.

There is properly an emphasis on such matters as depreciation, and interest on investment, and the all important need for getting all expenses reckoned into costs. An excellent classification of expense accounts has been presented for your consideration, and it has been very properly pointed out how it will be possible for the owners and executives to have each month both a manufacturing and trading statement and a balance sheet in dependable form, if only you will operate an adequate cost and accounting practice.

All of these advantages are before you, as many of the members have already learned individually to their great benefit, if only you will get together for effective action in regard to this important matter.

There are two things fundamentally necessary for the Gas Engine Association, or any other group of manufacturers who wish to work together to develop uniform cost accounting methods. The first is to define in common terms the underlying principles of good cost accounting, and the second is to develop methods and make applications of these principles that are adapted to the needs of the particular industry.

Let us then first consider some of the matters of principle on which there should be a common understanding and agreement among the members of an association.

The Elements of Cost

You are all familiar with the three divisions of cost, namely, material, labor, and overhead or burden. Every manufacturer has all these three factors to deal with, no matter what his product or how simple or complex his cost system.

In most industries, and certainly in your own, which is concerned chiefly with the operation of foundries and machine shops, it is not so very difficult to get the direct charges from the original sources, that is, the payroll and the material distribution, correctly classified between direct and indirect costs, and to have the direct labor and material charges properly identified with the product.

When the members of this association compare costs on any product, such for example as a five horse-power engine, you can probably agree as to the direct material and labor cost. This should certainly be easy enough, if the comparison is made between two plants that both make their own castings, or both purchase from an outsider.

Burden

Very little cost accounting practice, however, has attained any similar precision, and there is almost no uniformity among different members of this or any other association as to the methods for distributing the indirect charges for manufacturing which are all comprised under the general terms of overhead, or burden.

To handle burden correctly, the plant must first be divided into departments, not by physical partitions, but in accordance with manufacturing conditions, each being considered a little factory in itself, having its own burden, its productive capacity, operating at full or curtailed production, and earning or failing to earn its overhead charges.

Land and Building Factor

The first burden charge to each department is for rent. In case the manufacturer rents his plant from a landlord, the rent chargeable to each department can be determined easily by apportioning the total rental paid among the departments in proportion to the relative areas which they occupy in the factory. In the more common instance, where the manufacturer owns his own plant, his expense corresponding to rent consists of interest and taxes on the land, and interest,

taxes, insurance, depreciation and repairs, and possibly heat and light on the buildings. The sum of these charges determined for each building in the plant, divided by the available floor space in each, gives a square foot factor which can be used to distribute the rent charges to departments.

Equipment Factor

Let us now consider that we have a factory with the departments clearly indicated and with the cost of the floor space used by each properly determined. Each department is provided with certain equipment necessary for the manufacturing operations which it must perform. The burden charges on this equipment will vary, because of the varying cost of the equipment, which affect interest, tax and insurance charges, and because the nature of the operations performed affects the depreciation. Charges of these various kinds are therefore based on the value and kind of equipment in each department. The sum of the rent and equipment charges are fixed whether any manufacturing operations are carried on or not, and are known as fixed charges.

Depreciation

It will be noted that in both the Land and Buildings factor, and in the Equipment factor, referred to in the two preceding paragraphs, mention is made of depreciation. For the purpose of association action, agreement in regard to depreciation is one of the most important matters to be considered.

Depreciation is common to all manufacturing enterprises. Buildings deteriorate, or become in time hopelessly out of date for the kind of manufacturing operation for which they were designed or perhaps for any kind. Machinery, it has been said, is on an irresistible march to the junk heap, and although its progress may be delayed by liberal repairs, it can be prevented. Recognizing these fundamental facts the entire cost of any manufacturing operation has not been reckoned until proper allowance has been made for depreciation of both buildings and equipment.

One of the most serious mistakes a business man can make, is to figure that depreciation is something optional, that he can provide for if he has a sufficient margin of profit, or ignore if the results of the particular year or semi-annual period have been unsatisfactory. Unless an adequate charge is regularly made, the result is an uneven and illogical statement of profit, and when depreciation is neglected, an over-statement of both assets and profits.

There are two principal matters to be considered in charging off depreciation; one is the rate, which depends upon the probable life of the asset; and the other is the bookkeeping arrangement by which the charge is made. For the purposes of your association, it is quite possible to agree upon appropriate rates for wooden buildings, brick and structural steel buildings, various kinds of shop equipment, etc. If this is done, all the members of your association will be making

the same kind of charges to cost, and on the same basis; and unless you do this there will always be a marked diversity in your cost calculation.

The easiest way to handle the bookkeeping for depreciation is to make the periodical charges to cost, and credit the corresponding amount to appropriate reserve accounts. If this entry is made large enough, repairs as made can be charged against the credit, and the balance allowed to stand as the net amount of depreciation. In making a financial statement the reserves will be deducted from the asset accounts. This plan is very much to be preferred to the common but objectionable practice of subtracting depreciation charges from the asset accounts.

Power and Repairs

The next charges are for power to drive the machinery and for repairs to keep the factory in good operating condition. The power plant should be considered as an individual unit, and the cost of generating steam and power carefully determined. The cost of operating the power plant will include, besides fixed charges, such items as labor, repairs, coal, water and supplies. Having determined the cost of power, each department using power should be charged with its correct proportion of this cost. If it is not feasible to record the power used by each department, the consumption should be estimated as closely as possible. Multiplying the horse-power hours used by the cost per hour, the power charge against each department is determined.

The repair department should also be treated separately, and its burden known. The original estimates on the cost of repairs in departments may be made from repair department records, or from a knowledge of the repair materials purchased, the payroll in this department, and its share of the burden. When work is done for the manufacturing departments such work should be charged to them in the same manner as it would be by an outside company. Including all the elements of cost in the repair charges puts the repair department on a fair comparative basis with outside contractors who would certainly include their burden in making estimates on the cost of work. When the charges are accumulated on the individual repair job they check the estimate in each department.

Indirect Labor and Supplies

The distribution of the cost of superintendence, foremen, helpers and other indirect labor is a somewhat harder problem, but when carefully analyzed by those familiar with the conditions this cost may be closely apportioned between the departments according to the service rendered.

The cost of supplies used by the several departments may usually be determined and distributed with considerable accuracy.

Applying Burden

When all the charges entering into the burden have been analyzed and distributed as outlined, a definite total annual burden for each department is known. Next, a standard of production must be determined for each department, and a standard burden charged per unit of production calculated. In case burden is to be charged by machine hour rates, a standard number of operating hours for the department (or for individual machines) must be determined and the rate per hour correspondingly calculated. Then as the product passes through each department it will receive proper burden charges per unit or per hour as the plan may be.

To summarize the operating details of this plan, each department is charged periodically with its proportion of the burden charges as they are incurred. It receives credit at the determined rate for the units produced or hours operated, and if production falls below normal a deficit appears showing the unearned burden for the period.

Unearned Burden

Lost working time may be due to mismanagement or general trade depression. A portion of the burden under these conditions will remain unabsorbed since part of the equipment has been idle. The cost of the product made in other departments during this time has not been any greater because of the idle departments. Thus the influence of varying production on costs is removed and costs then rise or fall only with the efficiency of the department.

The unearned burden in any one department usually represents conditions beyond the control of the department itself and accordingly, with unearned burden eliminated, the unit cost of lots produced may be fairly compared from one period to another, and made the basis for a satisfactory measure of the operating efficiency of the department. These costs may always be compared with the standards of efficiency which have been established, thereby giving a true conception of the value of the results obtained, regardless of any variance in the volume of production.

When the efficiency of a department is measured in this manner, there is no guess work because of which a foreman can dodge responsibility that is really his. Analysis of the burden charges shows that certain expenses are under his direct control. If he is made responsible for these expenses and perhaps given inducements for cutting them down, a substantial saving can often be made.

Manner of Handling Unearned Burden

Monthly cost reports show comparatively the amount of unearned burden, indicating the tendency of business conditions, and we must decide how to dispose of its cost. This is a matter of policy with different executives and is handled in different ways. Some consider it a clear loss and a direct charge to the Profit and Loss Account. Others accumulate a reserve in busy times to which the unearned burden

may be charged during times of depression. Because of the alternate periods of depression and prosperity, it is vitally important to know the cost of unused capacity in times of depression and to provide for it during times of prosperity. The distribution of earnings to stockholders is stabilized by accumulating in this way a surplus from part of the earnings of good years in order that dividends may be paid during poor years when earnings fall off.

When burden has been handled as outlined, the necessary information is continually brought to hand for use in planning to meet these emergencies. Each month the executive should know and can know what percentage of the total burden was unearned, and the cost of this unearned burden in dollars and cents. He should know what this cost will average in one, three or five years. He should know how much his selling prices would have to be increased, if necessary, in order to meet the average cost of unearned burden. Or, assuming that selling prices are so fixed by competition or other conditions that it is absolutely impossible to increase them, he should also know how much the volume of his sales must be increased in order to accomplish the desired end.

Unearned burden must be considered in making selling prices because the cost of unearned burden must be met, either by increasing prices so that the increased revenue will offset the unearned burden, or by increasing sales and therefore volume of product to the point where there will be no unearned burden. If these alternatives are impossible, then unearned burden will be a direct drain on profit and loss, and if this drain continually exceeds the net profits from manufacturing, then the business will be a failure.

By having these pertinent figures continually before him an executive can see absolutely in which direction his business is heading. He will have records which can be relied upon under all business conditions to give such information as will enable him to plan his manufacturing and selling policies with a maximum of foresight.

Foundry Cost

So many of the gas engine manufacturers are operating their own foundries that it is in order to describe briefly what is necessary in order to get the correct cost of castings.

Unless you are making uniformly one size of engine in your plant, it is highly desirable that you should take account of the varying costs of large and small castings, even if the range in your own foundry is not as great as that which may be found in some other industries.

To do this it is necessary first to establish the inclusive cost of melted metal. This will be made up of pig iron, scrap, fuel, labor and overhead charges for the cupola. According to the size of the foundry and range of its operations, it will be desirable to state these factors in more or less detail, but the total cost of metal at least should be charged to castings at the cost rate per pound. For administrative purposes it is desirable to record separately material, labor and over-

head costs at the cupola, state the ratio of fuel to iron, and record the total weight of metal poured from the charge, and the total weight of good casings made each day.

Beyond that you have the molding and core-making costs, which can be kept as individual and separate for different patterns, as the subsequent machine shop operations on the castings. The burden charges on molding and core-making should be applied on the direct labor, preferably in proportion to the number of hours on each job. However, if the wages are very nearly uniform, approximately the same results can be secured by applying overhead as a percentage of the molding and core-making labor.

Beyond that you have the cleaning charges, pattern making and some miscellaneous foundry expenses, which may be reckoned as an average cost per pound of good castings if the work is not so varied that a greater refinement is necessary. Repairs, it should be understood, should be charged to the department for which they are incurred, and included in the burden for that department.

Machine Shop Costs

According to the general principles already defined, machine shop costs should be determined on each part manufactured, material, labor and burden separately.

This can be conveniently accomplished by a series of production orders, usually for individual parts, for which the first charge will be for the castings purchased (or at cost from the foundry as above described) and subsequent charges from the shop, for labor and burden actually applicable to the order.

The labor charges applying to production orders in your industry should be made to agree in total with the payroll. Details may be handled on daily work tickets or individual job tickets, according to the requirement of the different shops.

Burden charges, developed as to amount according to the principles already defined, should be distributed wherever possible in the machine shop according to what is known as the Machine-Hour-Rate method, whereby a rate is determined for each machine as definite as for the man who operates it. The charge for burden is made to individual jobs at this machine-hour-rate, exactly as for the labor on the part in question.

In many of your shops the machines do not vary widely in size or cost, and the parts go from one machine to another, so that you can get very good results by dividing your machine shop into three or four sections, and perhaps separating only machine work from assembly, and establishing separate burden rates on the two.

In your industry you have the additional cost of testing and some considerable charges for crating and shipping, both of which can be determined and scheduled with considerable accuracy for each size of engine that you make. It would be advantageous for you to agree upon such details if you are to avoid some of the complexities that otherwise would be necessary to secure absolutely accurate costs.

Conclusion

With variations suited to the requirements of individual shops, this is an outline of the procedure necessary to have accounting in your various establishments on common terms. If we may fairly judge by the experience of other associations, it will pay you well to agree as to principles and methods, adopting a standard cost and accounting practice for your industry, and take the most active measures possible to see that this common standard is understood and adopted by all gas engine manufacturers.

Discussion

The President: If any of the members of this association desire to discuss this matter I shall be glad to hear them.

Mr. Bolens: As I understand the gentleman, he will apportion the cost for each part of the engine, and that in my opinion will necessitate quite an amount of work, whereas if you have piece cards you can attach them to the piece of work, and each man who does any work on that can enter it on the card, and pass it along to the next, who can enter his time, so that when the job is finished the boss can take off the card and there you have the whole thing before you. I have seen shops where eighty-five or ninety per cent. of the work done has those cards attached, and they all know the cost of that work at a glance. If you keep those cards you can always tell the cost of that piece of work and can as well schedule it before as afterwards, and if you do so that schedule will always tell you the cost if a similar piece of work should be ordered.

Mr. Roberts: There is one good point worth considering, and that is whether it is better to have a general apportioning of the overhead charges and insurance, etc., to all the work in the building or to each individual machine. I do not think the method of cost accounting will work out in the way suggested, and prefer to apportion the expense to the whole work of the shop.

Mr. Bursley: We ascertain the cost of every piece which enters into the unit of construction, and when they are entered we have the unit cost as you suggest. If we have to use the large machines for parts of the unit they would be noted as carefully as those of the smaller machines, and I would thus be certain that each unit bears its proportionate share of the charge for interest on capital, insurance, taxes, and all the overhead charges, which I suppose would run up to fifteen or twenty per cent.

Mr. Fisher: Our education will never be complete until we go to the University of Wisconsin. Mr. Ward says he is informed that the practice is if you have one size of a sewing machine to build, all you have to do is to take the machine and divide it by twelve pieces, and you get the normal cost. If all the different pieces are the same practically you may do that, but if you have different elements to contend with I do not see how you can very well do that.

Mr. Roberts: I want to explain my own experience of gas engines. In all the factories I know about, and I have spent some time I think in each, examining the operations of the different machines, I have not found one in which that system of cost accounting is adopted, as it seems to me it is too complicated. I make about twenty different models, and all bear the same proportion of the cost of milling, grinding, labor, insurance, etc., instead of making an individual entry for each job, which it seems to me would entail a great deal of clerical work which I do not find necessary. If the average gas engine manufacturer were to make up his cost on all machines, and then divide it up, you will get the same result as before.

Mr. Bolens: What do you think of the merits of the tag scheme, having it go right with the machine or crank into the shop and remain attached to the job until it is completed? It will go right along with the job in the shop and let the men fill in the time consumed in his part of the work, the idea being to have the workman record and the material consumed by him, and his record can be verified by the next man who receives the job, and he in turn will record the time he spent, and so on. It seems to me that by that method you will get a pretty correct data.

Mr. Scovell: I would like to make it plain, that that is a detail of practice, and there is no principle in it which any of you gentlemen would care to use. It is a miserable makeshift which I would not recommend even for an emergency in any of your shops. I prefer for a man to make out an independent return, and let it be handled by one of the clerks. In the first place it will cost three times as much money for the shopmen to do that piece of clerical work than for a clerk. In the second place, while the work is in progress the tag is covered up, and most of the time you don't know where it is then if the workman fills it up his hands are dirty and heavy, and he would generally call his shop mate to help him fill it out, and by the time you received it it would have cost you three times as much as it would if a clerk made each independent entry. In addition to that, if the man should loaf on his work, his shop mate who handled the job after him would not draw attention to it, but on the contrary he would be disposed to shield his shop mate and try to help him out. On the other hand, with a proper system of cost accounting there will be a general principle for you to follow, and the result will be uniformity in the time required to make a ten horse-power engine, together with the metal used, and you will all be making at a correspondingly uniform price. It seems to me that you gentlemen can get together and talk over the general principle of cost accounting, and having ascertained that, standardize it for this association, and by that means you will be of the greatest assistance to each other in economizing the cost of production, and will increase the efficiency of all your employees, for then you have the element of doubt removed, and that is the main thing. It is almost impossible to explain all the workings of such a

system in the space of a few minutes, and in addition to that there are so many elements which enter into the efficient and economical management of a large plant which would not occur to my mind until I was actually in the plant, and making such an investigation as may be necessary in order to obtain the data on which to base a system of cost accounting which would meet every case. It is hardly necessary for me to tell you that I enjoy this work hugely, and have been practicing this very work for the past twenty years, and if opportunity is afforded me I shall be happy to be further acquainted with you.

The President: There will be a slight change made in our program for this afternoon, owing to the fact that Mr. Belt, of the Federal Trade Commission, who has been associated with Mr. Segner in the work of the Cost Accounting Committee, is compelled to leave in a few minutes, and therefore with the permission of the Association I will call upon Mr. Belt to address us at this time. I have the pleasure of introducing Mr. Robert E. Belt.

Remarks by Mr. Robert E. Belt

Gentlemen: The chairman of your Committee on Cost Accounting, Mr. Segner, and myself, talked over the question of cost accounting, and as to whether or not I might be of some assistance to him in arriving at a proper basis on which to predicate a system. Owing to my connection with the Trade Commission I have the opportunity of meeting with trade organizations, making investigations in regard to the operations of business plants. It was soon discovered that a great amount of the competition in business which exists today followed and resulted from the competition of prices made in ignorance of the true cost of production, and for that reason our commission decided to join with the organization in different quarters, and to assist them in advising their members on matters connected with the economical management of their business, and in standardizing information and methods to a certain extent, including in many instances, their overhead charges, and in that way prevent ruinous competition. I am glad to say that our organization has received great support and encouragement from the trade organizations, and is apparently meeting with great success. I do not know that I can go any further than to say I am glad your association has gone into the question of cost accounting of the products and material, and I may say that it has been determined by those associations that a representative from each of them and from ours, shall meet and discuss such changes as may be necessary in the management of their businesses from a general basis, so as to gradually introduce a system of efficiency which never has yet been attempted, and I am sure all would welcome a representative of this association if you see fit to send one. As I say the object we are seeking to accomplish is the introduction of standards of cost of production and accounting, so that each producer shall know the cost to him of the article he produces absolutely, and then he will be prepared to meet the competition which he has to encounter know-

ingly and intelligently. I hope before the next meeting of your association I may be able to render some assistance to Mr. Segner, the chairman of your committee, and that some standard may be arrived at which will meet with the hearty approval and co-operation of you all, and assist materially in the economical and successful management of your plants.

The President: The association will now hear from Mr. Main, being a report of Cost Accounting Work done at the University of Minnesota, which I am sure will prove of great interest to you all. I have the pleasure of introducing to the association Mr. T. N. Main.

REPORT OF THE FINDINGS IN THE INVESTIGATION MADE BY THE UNIVERSITY OF MINNESOTA CLASS IN APPLIED ACCOUNTING IN REFERENCE TO COMPARISONS OF COSTS OF VARIOUS MEMBERS OF THE NATIONAL GAS ENGINE ASSOCIATION.

Historical.

For the information of the various members of your association who have not contributed to the data requested, we wish to advise that the idea of analyzing the difficulties confronting them in regard to the comparison of costs was first taken up by the president of the Commerce Club, (an association of students of the University of Minnesota) with your president, Mr. Bement, at which time it was referred to the chairman of your Cost Accounting Committee, Mr. C. B. Segner, with whom all subsequent correspondence has been conducted. The matter being one of great moment and covering a territory of conditions almost inconceivable, it was with considerable difficulty that any definite method could be ascertained which would develop the information required.

The first efforts were along lines of prime cost, but, owing to the great variety of designs which required different machine methods and different quantities of materials, we discovered that, even if we designated a certain casting or piece, the element of shop operations would be developed and comparison would be lost.

The prime cost method was then abandoned, and an endeavor was made to average the totals from the contributing companies' books so as to make a comparison from results of the various departments. Owing to the numerous systems employed, this was found to be impractical, and the last method to develop differences was to eliminate from comparison the prime labor and material cost altogether and arrive at a comparison of the compilation of burden. With this resume of the various efforts, we will endeavor to outline the conclusions at which we have arrived.

Designs.

It is customary for manufacturers to want comparison with their competitors in units of any machine which they manufacture in com-

petition with others. For example, one manufacturer is building a ten horse-power stationary gas engine and selling in competition with some one else who is also building a ten horse-power stationary gas engine. That manufacturer is interested in knowing wherein his machine costs are more or less than his competitor's and also in knowing where his machine is of more use to the consumer.

We will only discuss the cost end of this proposition. Every manufacturer will concede that design of a machine or engine is one of the prime factors in the reduction of cost. Therefore, the design is an important element in judging the value of the complete engine in comparison with the competitor. To make ourselves a little more definite, we might take the base of two competitive engines and find that the actual cost of one base in labor and material was double that of the other, but both served the same purpose. One can readily see, then, that for the manufacturer who uses the high priced base, taking it for granted that the balance was in relative value with the other, his cost would be considerably higher. Therefore, it becomes apparent that in our deliberation it would be necessary for us to eliminate the direct cost of labor and material owing to the varied designs that are being manufactured by the various members of your association. You can readily understand that in molding a base as above mentioned, there could easily be an advance in the labor cost or an increased material cost, owing to the increased weight to produce the design of this particular manufacture. To carry this idea further, it would follow that a complicated design of a base or any other part of an engine would require complicated tools to machine and complicated jigs to assist in the machining, and the increased cost must be absorbed in the manufacture because of difficult design.

You will, therefore, realize that our first conclusion is that prime material and prime labor cost would have to be eliminated in our comparisons, with the exception of foundry or casting cost per one hundred pounds. This comparison is always available and can be used to advantage in most cases regardless of designs. While a comparison of this nature in regard to design has to be handled with judgment, yet the relation of cost per one hundred pounds on castings can always be used by any manufacturer as a basis to determine the efficiency of his foundry, providing certain regulations hereinafter stated are complied with.

Burden Charges.

The old question of burden charges and distribution, which will be considered later, has been one of discussion since machines were manufactured and it is not our motive in this report to decide any of these various discussions that have permeated the manufacturing world since time immemorial. However, our conclusion regarding burden charges in your association is that they should be built on exactly the same line in each plant and accumulated under the same system. We have found in our study of this matter various methods

of compiling burden charges and for your information will advise that, in a recent survey made by this class, the following facts were determined. Out of 151 burden items, there were only 30 handled in the same way by those who reported. This, you will see, represents only 20 per cent. on the same basis. You can readily understand why the burden percentages range from less than 100 per cent. to over 500 per cent. on productive labor where the productive labor method has been used and we assume that other methods would show similar results. It is apparent then, that, with these conditions, comparisons would be impossible between the different members' cost sheets.

You will please bear in mind that we are not referring to the distribution of burden but simply the matter of compiling charges and getting them ready for distribution. This we consider much more important and vital to correct Cost Accounting than we do the method of distributing these various charges to the various machines and parts, as you will readily agree that, unless burden charges are computed in like manner, your results will be proportionately apart and your percentages will reflect, not the difference in cost but the differences in methods of compiling costs. Therefore, you would have to take a unit of an engine for comparison, which we have definitely decided is impracticable, in order to arrive at a comparison or else reduce compilation of burden charges to a uniform method in order to show a comparison of burden by percentages. Unless burden charges are unified in a similar manner, we believe it impossible absolutely to ever be able to intelligently compare cost that on any other basis the results of comparison would be more harmful and promote little but worthless discussion.

In order that this report may be of the greatest actual advantage from our point of view we append hereto a card of accounts with the idea of reducing the compilation of items of burden charges to a uniform basis. We do not wish to be understood that this card of accounts is entirely beyond criticism but is simply a suggestion on our part to eliminate any erroneous impression as to what we believe is a correct method of compiling the burden charges.

Method of Distribution.

The same comment that was made in the above paragraph in regard to burden charges will apply in regard to the method of distribution. The various technical works on Cost Accounting will give you a better bird's-eye view of this line than we would care to express in this report. We might refer you to "Factory Costs," by Frank E. Webner; "Cost Accounting, Theory and Practice," by J. Lee Nicholson; and "Proper Distribution of Expense Burden," by A. Hamilton Church.

We might comment that any of these burden methods in specialization possibly have their good features, while few of them could be operated in the wide manufacturing territory covered by your association. Therefore our conclusions in this matter would be that

personal investigation of each plant and conditions would be a necessity in order to formulate a burden distribution satisfactory to your members.

It should be pointed out however, that the prime significance of the distributive method lies in a possible divergence of charges from one product to other products where they cannot possibly be applicable. We think it wise to caution against complication in distribution methods, as frequently more time is spent in attempting to distribute burden correctly than the results would warrant. To avoid unnecessary complications, an expediency may be used which would give results so near an exact distribution that the extra expense would not be advisable. The members of your association would have to eliminate the individual method of distribution which would require elimination of pet ideas.

We are fully aware that the products manufactured by the members of your association vary with almost every individual concern. Therefore, great care must be used in a distributing method that will not reflect an erroneous impression with the plants that have a more complicated product than others. In some plants you will find a distribution by arbitraries will be necessary owing to a lack of equipment to distribute accurately. In this class will come power, light, and heat, and kindred expense accounts. In cases of this kind it will seem advisable for the arbitraries to be settled on by your association so that they will correlate with plants that are equipped with mechanical devices for this purpose. If this method could be perfected the differences in cost, should they be placed before a committee for the purpose, would indicate additional cost of design, material, and shop operations, and the information would therefore, be of value to your members.

Card of Accounts.

While at the present time your comparative cost figures are of little value owing to the varied methods used in arriving at the cost, the card of accounts which is appended hereto sets forth a system for handling the various items that constitute burden charges in the following manner:

1. General Selling Expense Charges.
2. Fixed Charges.
3. General Manufacturing Expense Charges.

The items covered in this division are the items difficult to distribute accurately, and would have to be governed by the rules and regulations agreed on by your association.

The next division will be termed Direct Charges.

1. All expense labor chargeable direct to the factory as itemized partments.
2. All supplies used in manufacturing chargeable direct to various shops or departments.

This division would cover all of the burden charges in operation except general manufacturing and the foundry.

The next division would cover foundry operations divided as follows:

1. All expense labor chargeable direct to the foundry as itemized by the card.
2. All supplies chargeable direct to the foundry as itemized by the card.

In this connection we deem it advisable to bring out the prime charges of the foundry so they will not be confused with the burden charges. You will therefore have another division which is not burden charges:

1. Materials charged to metal cost of castings.
2. Labor charged to metal cost of castings.

Both of these items have been itemized in the card of accounts so that they will not be included or confused with burden charges. We are aware that the line between burden charges and labor burden charges charges to melted iron is sometimes a matter of discussion, as well as other kinds of labor in the foundry being sometimes confused with burden charges.

Taking the divisions as indicated above we believe you will be able to conserve the uniformity of your charges in this department.

It is impossible for us to determine definitely just how these various charges should be distributed as indicated by a former clause in this report but, this, of course, could be changed at any time the association might deem advisable.

With these comments bearing on the card of accounts, we feel that the careful study of the same will answer all the questions arising therefrom.

In Conclusion.

After careful deliberation our final conclusions in regard to comparisons are that:

First. Except in unit or design comparison, prime labor and material costs must be eliminated.

Second. Compilation of burden charges must be accumulated by a uniform method.

Third. Distribution methods in the main must be on a uniform basis with sufficient local adjustments to fit the plants individually.

In conclusion we feel that by following the above outline it will be possible for your association members to intelligently compare expense percentage on productive labor or burden hour cost or make other groups that will be on the same basis and on which valuable comparisons could be made. This refers particularly to your foundry cost where you can compare cost of metal to the cupola; of metals put into the cupola; of labor charged to metal cost; as well as burden charges in the foundry which will give you a total comparison of castings, by the hundred-weight divided into subdivisions as follows:

Cost of metal in the mold per hundred-weight.
 Cost of direct labor per hundred-weight.
 Cost of burden per hundred pounds.

In fact, by strict compliance with the above outline a committee could render valuable information to your association without materially disclosing private information.

The members of the Class in Applied Accounting wish to thank the members of the National Gas Engine Association, and in particular, Mr. C. B. Segner, Chairman of the Cost Accounting Committee for their generous assistance and help in the survey they have conducted in cost accounting and trust this report can be used with future benefit to all concerned.

Respectfully submitted,

C. L. POTZEL.
 JEFFREY GRUBER, JR.
 E. E. HERRICK.
 G. SIDNEY HOUSTON, JR.
 T. N. MAINS.
 L. D. SINCLAIR.
 R. C. THOMPSON.
 ARCHIBALD F. WAGNER.

Acknowledgment.

In submitting this report we wish to express our appreciation for the co-operation and generosity of the firms named below in furnishing us with data from their private accounts and records. Without the assistance they have thus rendered this report would be impossible.

The Baker Manufacturing Co., Evansville, Wisconsin.
 The Domestic Engine & Pump Co., Shippensburg, Pennsylvania.
 The Gray Motor Company, Detroit, Michigan.
 The New Way Motor Company, Lansing, Michigan.
 The Novo Engine Works, Lansing, Michigan.

CARD OF ACCOUNTS.

General Sales Expense.

ADVERTISING

Trade Journals
 Catalogues
 Postage, Stationery, Envelopes and Miscellaneous
 Fairs
 Circulars

ADMINISTRATIVE SALES

General Salaries
 Clerks
 Stenographers
 Janitor

GENERAL SALES EXPENSE

Stamps
 Stationery and Office Supplies
 Telephone Rentals
 Telephone Tolls when not specified to Departments
 Personal Property Tax
 Insurance
 Depreciation—Equipment
 Office Light and Heat
 Office Supplies, Towels, etc.
 Office Repairs
 Emergency
 Discount and Exchange
 Credit Department Expense
 Interest

DEMONSTRATION

Home Office—
 Dept. 1
 Dept. 2
 Dept. 3
 Dept. 4

Agency—
 Dept. 1
 Dept. 2
 Dept. 3
 Dept. 4

Departmental Sales Expense.

DEPARTMENTS—A-B-C-D-E-F-G

Salaries
 Estimators
 Salesmen
 Clerks
 Stenographers
 Travelling Expense

- Donations
- Clipping Bureau
- Commisissions
- Reserve for Bad and Doubtful Accounts
- Agency 1—Same as above
- 2—Same as above
- 3—Same as above
- 4—Same as above
- 5—Same as above

Fixed Charges.

TAXES

- Personal
- Real Estate
- Excise and Income

INSURANCE

- Buildings
- Equipment
- Raw Stock
- Finished Stock

DEPRECIATION

- Buildings
- Equipment

General Manufacturing Expense.

OFFICE AND GENERAL EXPENSE NOT CHARGEABLE TO SALES

LABOR

- Care of Lawn
- Miscellaneous
- Janitor

PURCHASING AND STORES

- Telephone Rentals
- Telephone Tolls
- Telegrams
- Subscriptions
- Donations
- Association Dues
- Miscellaneous

STATIONERY AND OFFICE SUPPLIES

- Stationery
- Supplies—Pencils, Pens, etc.
- Postage

STABLE EXPENSE—LABOR

- Barn Labor
- Teamsters' Time
- Repairs to Wagons
- Repairs to Harness
- Horseshoeing

PURCHASES AND STORES

- Hay and Straw
- Grain
- Medicine and Veterinary
- Miscellaneous Supplies
- Repairs on Wagons
- Repairs on Harness
- Horseshoes

YARD HAULING—LABOR

- Teamsters' Time
- Handle Between Shops
- Repair Yard Wagons

PURCHASES AND STORES

- Miscellaneous
- Yard Hauling Outside Teams
- Repairing Wagons Used in Yard

EXPERIMENTAL

- Labor
- Material

POWER HOUSE—LABOR

- Engineers
- Firemen
- Electricians when not on Orders
- Cleaning
- Unloading Supplies
- Loading Ashes

PURCHASES AND STORES

- Waste
- Soap and Brushes
- Machine Oil
- Electrical Supplies
- Gasoline and Kerosene
- Packing
- Coal
- Water Purifier
- Cylinder Oil
- Air Hose
- Valves
- Liability Insurance

LABORATORY

- Chemist's Time
- Miscellaneous Labor
- Supplies

EXPERT EXPENSE

- Salary
- R. R. Fare
- Expense

REPAIRS AND RENEWALS—BUILDINGS

Labor
Material

REPAIRS AND RENEWALS—EQUIPMENT

Labor
Material

Operating Expense

SHOPS A-B-C-D-E-F-G-H

SHOP SUPPLIES AND FOUNDRY MATERIALS

Code.	Code.
50. Alcohol	105. Crucibles.
51. Beeswax.	106. Cutters.
52. Bellows.	107. Cutting Compound.
53. Belt Hooks.	108. Dies, Small.
54. Belt Lacings.	109. Diamons.
55. Benzine.	110. Draughting Materials.
56. Blue Print Materials.	111. Drills.
57. Bone, Case Hardening.	112. Electrical Supplies.
58. Borax.	113. Emery and Emery Cloth.
59. Brooms.	114. Emery Wheels.
60. Brushes, Dry.	115. Emery Wheel Dressers.
61. Brushes, Painter's.	116. Feed Irons.
62. Brushes, Wire.	117. File Handles.
63. Cans, Oil.	118. Files.
64. Cement.	119. Lead, Mexican.
65. Chaplets.	120. Leather Fillet.
66. Fire Brick.	121. Lumber.
67. Fire Clay.	122. Molasses.
68. Flour.	123. Nails.
69. Forks, Coke.	124. Oil, Air Hose.
70. Gas.	125. Oil, Core.
71. Gasoline.	126. Oil, Cylinder.
72. Glue.	127. Oil, Fuel.
73. Grease.	128. Oil, Lard.
74. Gauges.	129. Oil, Linseed.
75. Hammers, Babbitt.	130. Oil, Machine.
76. Handles, Hammer and Sledge.	131. Packing.
77. Hose, Air.	132. Paint for Marking.
78. Kerosene.	133. Partomel.
79. Reamers.	134. Pens and Pencils.
80. Riddles.	135. Pig Iron.
81. Rosin.	136. Plumbago.
82. Salamoniac.	137. Punches.
83. Sal-soda.	138. Purifier, Water.
84. Sand, Blasting.	139. Putty.
85. Sand, Core.	140. Soapstone.
86. Sand, Moulding.	141. Solder.

87. Saw Blades, Hack.	142. Spark Plugs for Testing.
88. Saws.	143. Stationery.
89. Sea Coal.	144. Studs, Tinned.
90. Scrap Iron.	145. Taps.
91. Screws, Wood.	146. Thumb Nuts.
92. Shear Blades.	147. Tool Steel.
93. Shovels.	148. Trowels.
94. Slings, Rope and Chain.	149. Turpentine.
95. Soap.	150. Twine.
96. Clamps.	151. Valves.
97. Coal, Blacksmith.	152. Waste.
98. Coal, Steam.	153. Water, City.
99. Coke.	154. Watchmen's Supplies.
100. Coke, Foundry.	155. Wax String.
101. Core Binder.	156. Wire.
102. Core Compound.	157. Wood for Cupola.
103. Core Wash.	158. Wrenches.
104. Crayons.	

Expense Labor

Code.	Code.
1. Blue Print Labor.	24. Internal Trucking.
2. Breaking Scrap and Wood.	25. Lacing Belts.
3. Care of Motors and Lamps.	26. Making Forged Cutting Tools.
4. Care of Water and Air Pipes.	27. Making Formed Cutting Tools.
5. Charging and Tending Cupola.	28. Making and Repairing Small Dies.
6. Chipping.	29. Making Small Tools.
7. Changes in Patterns.	30. Mixing Sand and Facing.
8. Changes in Drawings.	31. Pouring Iron.
9. Cleaning Foundry.	32. Removing Ashes.
10. Cleaning and Oiling Machinery.	33. Repairing and Relining Cupola.
11. Core Carriers.	34. Repairing Flasks.
12. Crane Operators.	35. Repairing Patterns.
13. Cutting Sand.	36. Shop Clerks.
14. Crating Labor.	37. Supervisors When Not on Orders.
15. Draughtsmen When Not on Orders.	38. Sweepers and Cleaners.
16. Firemen.	39. Timekeepers.
17. Flask Carriers.	40. Toolroom Foremen and Assistants.
18. Foremen and Assistants.	41. Unloading and Handling Material for Foundry.
19. Grinding Labor.	42. Unloading Steam Coal.
20. General Shop Labor.	43. Watchmen.
21. Handling Coal, Coke and Ashes in Blacksmith Shop.	
22. Handling Lumber.	
23. Inspectors.	

Foundry Production

MELTED IRON—LABOR

Breaking Scrap
Cupola Tenders
Stock Cores
Pouring Iron
Unloading Stock

PURCHASES AND STORES

Coke
Flour
Sea Coal
Plumbago
Core Binder
Soapstone
Molasses
Cement
Moulding Sand
Core Sand
Core Wash
Core Compound
Partomel
Pig Iron
Scrap
Core Oil
Wood
Mexican Lead
Rosin
Wax String

INDIVISIBLE PRO. LABOR

Chippers
Core Carriers
Flask Carriers
General Labor
Mixing Sand and Facing
Pattern Storage
Mixing Core Sand

The President: The next order on the program is the report of the Cost Accounting Committee, which will be read by Mr. Segner, its chairman, and I am sure we will all listen to it with great pleasure.

Mr. Segner: I am very sorry that Mr. Belt could not stay with this convention during its entire session, because he came here for the purpose of helping us out, but he wanted me to thank you gentlemen for the courtesy extended to him by a gathering of manufacturers whose interests his association desires to serve in every possible way, and who will be pleased to have this association delegate one or more

of its members to meet with the Federal Trade Commission and help in carrying on the work which cannot fail to be of great advantage to all manufacturers in this country.

REPORT OF COST ACCOUNTING COMMITTEE

C. B. Segner, Chairman

Your committee wishes first to again call to your attention the deductions established in the interesting and valuable report of the class of applied accounting of the University of Minnesota.

First. Comparison of prime labor and material costs between different manufacturers is not practical on account of differences in design and construction.

Second. Compilation of burden charges must be accumulated by a uniform method.

Third. Distribution methods, in the main, must be on a uniform basis, with sufficient local adjustments to fit the plant individually.

To the above, your committee wishes to add a fourth and a fifth, which, while not specifically mentioned, are very apparent throughout the report.

Fourth. Personal investigation of each plant and conditions, would be a necessity, in order to formulate a burden distribution satisfactory to all.

Fifth. On account of the variations in product and equipment of our manufacturers, a set form of cost system that can be used by all is impracticable. In other words, the forms for cards and books, and the machinery for collecting and compiling cost records, must be built up in each case to cover local conditions existing in each plant.

This brings us back to the recommendation made in our report last year, viz.: That a sufficient number of our manufacturers unite to employ a competent cost accountant, to visit the various factories, to help them arrange their accounts to correspond with a uniform principle.

The response to our recommendation was not very encouraging, only a few members signified their willingness to join in such a movement, but we still believe that our association should work for the consummation of this plan.

While it is true that a single cost system that will fit all our factories cannot be made, yet we are of the opinion, that it would be very desirable to have a simple system, suitable for the smaller factories, but embodying all agreed upon methods of treating accounts peculiar to our business. Such a system should serve as a model for any establishment, large or small, when installing or improving their cost system.

Your committee, therefore, offers as a first step towards such a system—a schedule of rates and methods for—

Depreciations and Reserve Accounts

Your committee is of the opinion that the very foundation for uniformity in figuring costs must begin with depreciations and reserve accounts. There are large differences of opinion even among expert accountants, as to the sound and proper rates for depreciation and regarding the introduction into factory costs of such items as interest on plant investment and reserves.

It therefore, becomes necessary that our members agree upon a schedule covering rates and methods of depreciations and reserves, and the schedule submitted by your committee is presented more as a suggestion than a recommendation. We urge, however, the adoption of a schedule at this meeting. A standard schedule can be used not only in the development of a cost system, but any manufacturer can apply it to his existing system of bookkeeping and figure whether his business, as a whole, is being conducted at a satisfactory profit or not.

In this schedule we have considered only those items which we believe belong in factory cost. It is our opinion that estimates of selling cost should include interest on material on hand as well as on overdue accounts, and should also include a reserve for dull periods. We hope that we may have time enough at this meeting for a discussion of items properly entering into selling costs.

Factory Cost, Depreciations and Expense Accounts

Buildings—All buildings should be depreciated at the following rates per annum: Frame, 5 per cent.; brick, concrete or steel, 3 1-3 per cent.

Depreciations figured from original cost. Permanent additions made to buildings, during the period, should be added to original cost before charging off depreciation. All alterations or repairs to building should be charged into "Building Expense." The term "Building" includes the buildings proper, heating plant, steam pipes, radiators, air pipes, electric wiring and fixtures, water pipes, concrete walks, fences, drains, etc.

Machinery—All standard machine tools should be depreciated 7 per cent. per annum from original cost. Special machines should carry higher depreciation based upon their probable period of usefulness. With the original value of machines is included freight, foundations, if necessary; also all equipment such as chucks, or direct connected motors, that are fitted permanently to the machine. All repairs or alterations to machine tools should be charged into "Machinery Expense" account.

Power Machinery—Includes engines, generators, motors, main line shafting and hangers, belting, pulleys, etc. This item should be depreciated 8 per cent. per annum, figured from original cost. All new belts, or other equipment purchased to replace worn out, should be charged to power expense account the same as coal, oil, labor, etc. No expenditure should be credited to the inventory value of this item, unless spent for permanent additions.

Shop Equipment—This item consists of cranes, benches, vises, shop trucks, bending rolls, anvils, arbor presses, and similar equipment. Depreciation should be 8 per cent. per annum from original cost. Repairs should be charged to machine shop expense.

Shop Tools—Drills, reamers, milling cutters, taps, dies, all standard tools in this class that can be purchased from catalog lists. All purchases made during a current year of this material should be charged to machine shop expense. At inventory time, an inventory is made of all tools in active use. These tools are valued, on inventory, at 50 per cent. of their original cost, regardless of their actual value or condition. If the net amount thus obtained should be more or less than the previous inventory, the difference should be credited or charged to machine shop expense. This method automatically appraises the value of tools, without depending upon the judgment of any individual, it being assumed that while a shop is operating, and new tools being constantly bought to replace those worn out, the actual value of tools will average one-half their cost when new.

Jigs and Fixtures—All jigs and fixtures used for standard product should be depreciated 20 per cent. per annum. Maintenance and repairs or new tools made to replace worn ones should be charged to machine shop expense. Only new tools, that have not before been in existence, should be credited to asset account.

Patterns—Patterns should be depreciated 30 per cent. per annum. Maintenance and repairs or new patterns made to replace worn ones should be charged to general shop expense.

Drawings—Should be depreciated 33 1-3 per cent. per annum, the cost of the original set only should be carried in drawings asset account, all subsequent drawings should be charged to general shop expense.

Experimental Work—All experimental or laboratory expense should be charged to general shop expense.

Guarantee Reserve—An amount equal to one-half of one per cent. of estimated sales for a year should be charged into overhead expense, to take care of expenses of free service, or to make good the guarantee of the manufacturer.

Spoiled Work and Wastage—All work spoiled by workmen should be charged against the department in which it occurred. This account should receive credit for salvage of spoiled parts.

Reserve for Idle Capacity—When the shop is running at normal capacity, an amount should be added to the overhead rates sufficient to create a reserve that will take care of a reasonable amount of idle capacity. We recommend that this amount be figured at 10 per cent. of all standing and fixed expense; in other words, enough should be charged into this account during 10 years of normal capacity so that if the factory was compelled to go through the 11th year without any output whatever, this reserve could be drawn upon and would be suf-

ficient to cover all expense that cannot be eliminated during dull periods, such as depreciations, interest on plant, taxes, insurance, salaries of foremen, firemen, etc., maintenance of buildings, and repairs to machinery, etc.

Interest on Plant Investment—All production of a factory should be charged with interest on real estate, buildings, machinery, patterns, tools and material on hand at 6 per cent. per annum; should all or any part of the plant be rented, the rental charges should be used instead of interest with this difference, however, that the rental charges will probably cover depreciation which, under such circumstances, need not be included in the costs.

Discussion

The President: The recommendation of the committee is that three and one-third per cent. depreciation on brick, steel or concrete buildings be adopted.

Mr. Segner: Yes, sir; but of course it is for the association to fix the amount.

The President: Our experience is that two and a-half per cent. is sufficient. What is your opinion on that point, Mr. Scovell?

Mr. Scovell: Your question is whether three and one-third per cent. is a reasonable compensation on a concrete building. As no one here has had sufficiently long experience to be enabled to speak authoritatively in regard to modern concrete buildings it is hard to give an opinion, but I think a typical concrete construction, such as I can recall in my travels, will justify two and one-half per cent.

Mr. Main: In regard to this question of depreciation, I do not think any manufacturer can figure on that with any degree of certainty. In the case of a concrete building, none of us have had sufficient experience to enable us to even conjecture what the life of a concrete building, whether 25 years or more or less. But the probability is that after a man has been in business for twenty-five years he will want a new and modern building, and it seems to me a reasonable thing to charge off a sufficient sum as will enable you in 25 or 30 years to erect a new and modern building in the place of the one you have.

Mr. Bolens: I want to relate an experience I had last week. We are putting up a new foundry over the old one, I mean including the old one in the site of the new one, so as to have the use of it while the new one is being constructed. In making our returns, I went before the commissioner and explained the matter to him, and said we want to eliminate the old foundry, and he said, "You cannot eliminate that from the cost of your new building. It is my advice that you do not take it off the old building, but divide it between the two." As it would have taken considerable time and trouble to have obtained the decision of the Revenue Department on that matter we regarded it as better to take the advice of the commissioner.

Mr. Walker: It seems to me that if the building is of value that would be a legitimate charge to the cost of the new building, because if I had not that building I would have to buy a site for a new building, and whatever I could sell the materials for I would credit to the cost of the new building.

The President: The question is whether a charge of three and one-third per cent. on the original cost is a proper charge.

Mr. Schreiber: The State of Wisconsin will not stand for three and one-third per cent., and I think there are other states which will not stand for it.

Mr. Walker: It seems to me that we are coming to something of vital importance to the manufacturers, and which may bring this association into conflict with the United States and the State of Wisconsin, and it may be well for us to consult with the Internal Revenue Department and have a ruling on that matter. The fire insurance companies and the railroad companies will also be able to give us some information on that subject.

Mr. Goodnow: We had an appraisal last year, and that was based upon the present cost of the building, or rather a percentage was made of the cost of the materials that went into the construction of the building. It was arbitrarily fixed. Some of the appraisers say three and a-half per cent., others say five.

Mr. Main: Most buildings should be appraised at the present time, as the increased price of the material will generally show an increased value on your books, and the decision of the revenue department is settled by the rating of the building, and what it will cost to construct it. Formerly the rating was fixed upon a different basis than the modern structures, but I am confident that a concrete building should have five per cent., that is for a shop where there is large machinery and small machinery in operation. Of course the larger the machinery the greater the percentage as compared with small.

The President: Is there anything which the committee has or which you can lay before the convention, which we can take as a basis? Practically you have shown that the Federal authorities have passed three and one-third per cent. and five per cent. Shall we let it go as the opinion of this association that that is a legitimate depreciation from the original cost?

Mr. Segner: I have not had sufficient time to investigate that subject so as to be enabled to answer with any degree of certainty your question, and I think perhaps the better way will be to defer until the next meeting the adoption of a standard amount for depreciation of the buildings. The committee recommends that all standard machinery should be charged with a depreciation of 7 per cent. per annum on the original cost. There are expensive and complicated machines on which that amount should be increased, but if 7 per cent. is adopted as the rate per annum in most cases that will furnish a new machine when the one you have is worn out.

The President: How would that operate in practice?

Mr. Goodnow: Our practice is to take inventory of the machinery with an average of from 5 to 10 per cent., depending on the machine and the condition of it.

Mr. Fisher: I am in favor of 9 per cent. on the original cost.

Mr. Goodnow: With us it varies under different conditions not below 5 per cent. and from that up to 15 per cent.

Mr. Segner: In our factory we estimate the residual or scrap value of each machine and then charge off the remainder in equal amounts over a period of from ten to fourteen years, depending upon the character of the machine. Standard tools, such as engine lathes, are charged off in fourteen years, while the more special ones in less time. We have had occasion, a number of times, to replace machines with new ones, and have always gotten as much for the old machine as it stood us on our inventory. Our method will average about seven per cent. depreciation, and judging from our experience, I should say that seven per cent. is a good conservative figure.

Mr. Bolens: There is one thing that must not be overlooked. A number of times I have bought second-hand tools, and put them in the departments, and for the first two or three years they would depreciate more than in any of the following years. I don't think it should be based on the principle of compensation. You know the natural life of a tool today is below the manufacturer's scale. I think all of you will agree to that, for even the modern tool soon cuts itself to pieces, and the depreciation of tools is by no means even. Speaking broadly, I don't think it is fair to put the life of a tool at ten years, and I really think that it should be the rule to fix 10 per cent. to secure the efficiency of the tool.

The President: Is there any objection to the recommendation of the committee, that it stand at seven per cent.? There being no answer, the chair will consider that clause of the report adopted and we will now proceed to the next clause.

Mr. Segner: In regard to the depreciation of power machinery, the recommendation of the committee is that 8 per cent. is the proper amount.

The President: We adopt 5 per cent.

Mr. Goodnow: I am informed by some managers that that is too low, but I do not think so.

Mr. Walker: That is not true of steam boilers.

Mr. Segner: No, that is not true of steam boilers, but we had to take everything into consideration and thought 8 per cent. was fair. Of course engines and generators cannot be in the same class, but that cannot make any difference in establishing the rate.

Mr. Bolens: I think 8 per cent. on the cost of cranes is too high; I think 5 per cent. would be nearer. We have twenty that have been at work for ten years, and each seems to be in as good condition as ever.

Mr. Segner: Perhaps these cranes should not be put in the same category for depreciation, and really traveling cranes should be considered as part of the building and not be included in the category of tools. The committee referred particularly to small cranes, vices, etc.

Mr. Walker: That is my understanding of the discussion and intention of the paragraph under discussion, that it shall automatically take care of the tools that are being used. If there is an excess of tools in the tool room there is no reason for their being inventoried. I move that that recommendation of the committee be adopted.

The motion having been duly seconded was put by the President, and unanimously adopted.

Mr. Segner: The next recommendation of the committee is that jigs and fixtures should be 20 per cent. per annum.

The President: Our practice is to fix the maximum price for a tool and never let it get above that. If it is a large one put it in, and get the advantage of all the money they will let you charge.

Mr. Ward: Will the revenue people let you do that? I agree that if you have a plant well established, and spend a few hundred more one year than in another, you would have no reason to change your figures, if you keep your cost increasing generally. Isn't it true that in a shop which is properly superintended, you would develop more than the percentage recommended by the committee?

The President: It may happen, for the life of a jig is very short, not because it is worn out, but if you inventory your jigs you will find that you have apparently a lot of money invested with nothing to show for it.

Mr. Segner: This contemplates that very point, if you have to replace your jigs with different designs or any other such matter. Of course, if you were going to inventory each particular piece it would be different, but in order to get a figure in your accounts that will take care of every living tool of this kind we thought 20 per cent. is the proper amount.

Mr. Walker: What about patterns?

Mr. Segner: The recommendation is for pattern depreciation 20 per cent.

The President: Would you not make a difference between metal and wood patterns?

Mr. Segner: No; while you use a wooden pattern you keep it repaired or make a new one if worn out, all of which should be charged to expense, and with a metal pattern, while it is not worn out it becomes obsolete, except where you may need it for repairs, and that doesn't amount to a great deal.

The President: We have to keep quite a large repair account, and use metal patterns as preferable for that reason.

Mr. Roberts: As matter of fact we make a large number of engines, and have to keep them for repairs, and it is advantageous to have them all charged up at 100 per cent. I do not think the amount recommended is too large.

Mr. Segner: The question was raised whether we should not charge them the same as fixtures and so regard them, and I am in favor of it, but whether patterns are as long lived as jigs I don't know.

Mr. Lauson: Some concerns set off reserve to meet the pattern account, and I think the pattern expense in all large foundries would be different, because the foundry expense will increase with the volume of work, and the depreciation charge will be different with different factories. I think the reserve is a very good idea.

The President: If there is no objection, this recommendation of the committee will stand approved. There being no objection, it is so ordered. The next is Clause 5, Drawings.

Mr. Beam: It seem to me that three years would run around pretty quickly. That seems to me to be too much to charge for the drawings of an engine.

Mr. Walker: It puts us in a serious position to keep some drawings for three years.

The President: There being no objection to that recommendation of the committee, it will stand adopted.

Mr. Segner: The next recommendation is that experimental and other expenses should be charged against the shop accounts.

Mr. Roberts: That does not apply to any shop at all, and don't belong in the shop. I always charge it in the general overhead charges. If the engineer has anything to do with the shop I charge it, but as a general rule I never have the engineer charges in the shop work. I would make it a part of the engineering expense, and put it there rather than in the shop expense.

A Member: It is part of the engineering expense and should be so charged, and it is permissible to charge it up in that way. If you charge it in that way they will not take it off.

The President: It is a good thing that some of us do not live in Wisconsin.

Mr. Segner: As a rule every one of us has a certain amount of experimental work that should be charged against shop expense. If you incur an extraordinary amount of expense in developing certain models, it should be proper for you to give yourself credit for that for a certain number of years. We are trying to get this thing up for present average conditions.

The President: As there seems to be no objection to that section, it will be considered adopted by this convention.

Mr. Segner: We come now to the item of guarantee reserve. I will read that clause of the report so that you may all understand it. (Mr. Segner reads clause from report.)

Mr. Walker: I want to take exception to the wording of the paragraph, as being not what it provides for. It talks about taking care of an over surplus, but it is not there, for we have charged for it. It might create a false impression; the customer pays for it and that is the truth.

Mr. Segner: The customer would pay for it if we put it in the cost.

The President: If you manufacturers have a \$2,000 allowance for selling expenses on which you unload a considerable amount of to the selling agent and in there you show repairs, and they have the stamped paper of a jobber, is there any such arrangement for this?

Mr. Walker: No.

Mr. Segner: In order to meet Mr. Scovell's suggestions you will have to take that out of the shop expense and put it in the selling expense. I would like to see it in the shop cost, although I am pretty nearly alone in that opinion. Still, if the practice and the opinion of most of the members is that it should be a selling expense, let us charge it to sales, but it should be charged somewhere.

Mr. Roberts: Do you consider it a selling expense when you get a fellow who doesn't know the accessories of any of his machine? I went to Baltimore once and we tried to get the accessories of a pump, but the fellow didn't know a thing about them. Is that a part of the guarantee?

The President: You are now discussing a matter not now in question. If it is a construction expense it is a good thing, but if it is guaranteed as a part of the machine it is the manufacturer's cost; otherwise it belongs to the selling expense.

Mr. Segner: Suppose you are manufacturing an engine, part of that engine is made up of accessories that you buy elsewhere. Take a magneto, for instance. We will say that the magneto costs you \$10; that is the figure you credit yourself at inventory time for each and every magneto you have in stock, and that is the figure you charge in your cost record of that engine. Now the manufacturer of that magneto is supposed to make good any defects that may develop. The price of \$10 at which we inventory that magneto is more than cost of manufacture; it includes the manufacturer's profit, cost of selling and an amount sufficient to cover guarantee. If we include these items in cost of parts we buy, why not in those we make ourselves? I believe we should establish some figure, based upon experience of a majority of manufacturers, that will cover the average amount of legitimate guarantee expense and let each one of us charge that amount to our cost of each engine sold. If it is the sense of the majority that this should be charged to selling expense, well and good, but let us all charge it. If any of us are able to make our engines better than the average and need not spend all that has been so charged to keep our engine satisfactory, so much the better. We deserve to put that money in our pockets, but let us recognize that such a charge is legitimate. The committee would like the association to determine upon a proper amount, make it a good, conservative basis and stand by it.

The President: The question is whether one-half of one per cent. will cover that.

Mr. Segner: Suppose \$100,000 represents the sales, we would get \$500. Would that be sufficient to carry you through?

Mr. Walker: I believe the modern form of guaranty covers both the soundness of the material, the accuracy of the workmanship, as well as the operation and sale. I think it should be advised in cases of this character to charge one-half of one per cent. to make the guarantee good. Outside of that it is a shop charge.

Mr. Stritmatter: The idea of development is most important to the trade. Everyone of us is interested in the development of something, but the repair list is clear profit. If there is a defective piece sent out, why should it not be charged to the repair account instead of charging it to the expense of selling?

The President: Is there any objection to this half of one per cent. guarantee fund?

Mr. Segner: It seems to me to be the sense of the majority that it should be charged to or included in the expense of selling rather than to shop cost. It is supposed to carry a shop guarantee I think. I supposed by being charged to the shop expense it was to take care of replacements which had to be made, and also to cover the cost of the guarantee. How does that sound? An amount equal to one-half of one per cent. charged to shop expense to take care of replacements and to cover the guarantee.

Mr. Bolens: It should cover the contingency of replacements. Suppose you had an unsatisfactory settlement and you had a law suit, how would you defend it? That is what you have to look out for in your guarantee.

Adjournment.

Mr. Segner: In the talk last night we had got to the section of spoilage work and wastage. All work spoiled by workmen should be charged against the department where it is spoiled, etc. Now, there is a difference between wastage that is legitimate and unavoidable, such as would be made by the operation of tools or machines, such, for example, as spoiling of a screw by the screw cutting machine, and you know there are very, very many screws which are so spoiled by breakage, etc., and that spoilage is legitimate and cannot be figured in this calculation, although it should be in some manner made a part of the cost of the work, and entered in the cost of accounting, and we will come to that later, but what I mean is things that cannot be accounted for in an inventory. In making up an engine you find pieces of material here and there, and we cannot account for what became of them. They are thrown aside and wasted, and they should be entered up in this charge account and charged to the department. Spoilage, you know what it is without my telling you. I do not suppose that this item needs any further comment on the part of myself or any member of this association, because we all know what it is and it should be included as a part of the cost accounting system. What I contend for is that it should be charged under a separate item from other expenses and charged to the department where the spoilage occurs.

Mr. Stritmatter: When a shop is running at full capacity, you may almost regard that a fair allowance for wastage, such as you have referred to, would be 10 per cent. of the whole expense; in other words, I think that should be added to the cost account of all the work.

The President: There being no further discussion, we will proceed to the next clause in the report.

Mr. Segner: The next clause provides for the amount which should be so charged. You have heard the report, and I will read that clause again so that you may not mistake it:

Reserve for Idle Capacity

That is an item that is a regular expense and the only question is how much percentage should be charged and how it should be charged. I believe we all recognize that no matter how good your management is you cannot possibly run your shop so thoroughly well that there will not be more or less idle capacity, idle time. Idle time is one of the most important elements in the management of a factory. I might make the best engine in the world and sell it at the lowest price, and have the best selling organization in this country, and there are times and conditions come up, especially recently, where it is impossible for you to keep your factory running, I mean running to its full capacity. Generally that loss is charged to overhead expenses as it is incurred. In other words, no matter how carefully and scientifically you may run your business and how good the article you produce is, you are bound to have an idle time for either the whole or certain parts of your machinery. That is a legitimate expense of your business, and is really a part of your cost of producing machinery, and that expense should properly be charged in cost accounting. Manufacturers make their engines or machines and charge the cost of material and labor and overhead expenses in their cost accounting. On that basis they fix their price which they think will give them a fair profit for the material and stuff used, and along comes the time when the shop is shut down, and still those expenses which I have referred to go on. Now, once you have fixed the price of an article it is not easy to increase this price, especially when the demands fall off, and if you have been selling your goods at prices based upon the shop running full time, you will find when the shop is slack that you are running at a loss and a decided loss. That I think will be shown by the records of every manufacturer. Of course it is up to you to use your foresight and prepare for that. I may assume that you declare dividends out of every cent you have and leave a reserve to meet just such an emergency and to prepare for just such a state of things, but lots of us do not think of that in prosperous times. The tendency is to adopt a sort of standard of their own to take care of such matters, but your committee suggests that the only proper thing to do would be for this association to adopt a standard method by which a certain percentage should be reserved in all cases to take care of such matters as I have called your attention to. Of course

that item enters into the factory costs. I know the average accountant will say that it isn't right that a factory should adopt any portion of that expense, but whatever we may do in regard to charging that expense to factory cost or in any other way, the fact still remains that we have got to meet it and pay it, and the only matter for us to discuss that I can see is what is the best course to pursue in handling this item.

Mr. Goodnow: I hardly feel that this is a matter of cost which should rightly be charged against the factory, but it appears to me that it should be charged against the selling expense, because it is plainly due to the lack of sales that the plant is idle. It is an expense and a liability, and as such will appear upon the books, but is not chargeable to surplusage. In other words, if you have one year in which your factory is idle, at the end of ten years of prosperity that item certainly should go into your cost of selling. In other words, it is a liability against your profits and should be charged at any time against the profits made during the year. It seems to me that if every year a percentage were laid aside in the way suggested it might be that you could go right along and pile up a surplus, and in that case or in a matter of that kind another question arises. Would the stockholders of your concern agree to your piling up a surplus for ten years and not pay it out in dividends? It seems to me that this is one of the questions of business management which can scarcely be handled as a standard by this association.

Mr. Ellis: I think Mr. Goodnow has satisfactorily answered this question. I have thought and discussed this matter over, and I never get satisfactory answers. It seems to me that it must be left with the management to decide, and I regard it as a question properly of management.

The President: Then how would you treat it?

Mr. Ellis: Well, I would treat it as an incidental account, and I would reserve a certain amount and let the other years where the profits were good furnish this account. Where we have an idle time, that account could be drawn upon to meet the deficiency. It seems to me, as I say, an expense which must be left solely to the management as to the how it should be charged and to what account, and I do not think the association is competent to dispose of it.

Mr. Segner: That is just what we are all trying to do, to adopt a principle on which we shall run our business. Naturally in an assemblage of this kind of manufacturers there are a great many different ideas. Each member has his own idea of managing his own business, and as a matter of fact, there are a great many methods adopted, all providing for a reserve account on the credit side of the ledger. While that is the proper thing to do, the question is how is it best to do it, and if we will recognize that this is something that cannot be avoided in any factory in the world, and that there are certain elements that enter in, that consumption of the

product will fall off and there will be an idle season, then we will know what we are doing, but if we do not do so, we will be up against it one of these days, and I do not see why it cannot be largely included in the factory cost. Factory cost includes everything of that kind; that is made up of elements which enter into the manufacture of the article. In other words, the factory cost will represent what it would cost us to produce the article and what we have to pay in order to produce it. When you have established that basis, then you have something reliable on which you can fix your price, because you can then figure your profits. You know what you are selling and what your overhead expenses are, but without having a reserve, I do not see how you are going to tide over those idle times without embarrassment. I do not believe in fostering or introducing into any factory an excuse for carelessness on the part of the management, but here is an expense which we must meet and which every manufacturer has to meet, and the question is how is the proper way of meeting it by a charge?

The President: I should like to ask Mr. Segner if he carries such an account in his manufactory, or if he does not, how he would carry it.

Mr. Segner: We carry it in the reserve fund. We do not carry it in the shop cost now, but that is really where it belongs, but even if we should carry it in the reserve account at the present time, we have no basis on which to estimate what percentage should be reserved, and we have no means that I know of of estimating our selling cost. We ought to have some figure by which we can accurately compute those expenses, and whatever plan this association believes to be the right one, we can use, all of us, in estimating our selling cost. After we have manufactured an article, we always have to estimate what it is going to cost us to sell it. That cost is a thing which may vary. In some houses it is thought that 15 per cent. is a reasonable cost; in others it is estimated at 20 per cent., and in others at 5 per cent., but in either one of these houses it is a matter of guessing. There is no basis on which we can accurately figure. We all know that in some houses it will cost a good deal less to sell goods than in others, and that would not be the case if you have a proper basis on which to estimate those expenses. It will not do to proceed on the principle that you will get along as cheaply as you can, because if you do that you are going to lose money. I can say that the object of this committee in its report is to fix a proper basis on which every manufacturer can proceed in fixing the cost price and the selling price of an engine and let that include also every cost and then fix your price.

Mr. Ellis: In determining this question there are so many things which enter into it. For example, things which properly belong to the foresight of the manager of the concern, and it must be left to him to make up what in his opinion is necessary to charge in the

accounts and how to charge them. Now, how are you going to get at the mind of the manager? Probably you may go to see him and ask him his opinion, and he may communicate it to you, and then again he may not. Each year there are new phases which arise in the conduct of any industry, and every year something appears upon the market which affects every industry and provides perhaps new results, and the result is all those things have to be met, and I do not care what the manufacture is, how large or how small, or what they produce, there are times when the results of their sales will show large profits to the plant, and other years a very greatly diminished profit. Profits are things which go up and then down again according to the volume of your business, and as such matters arise the manager has to meet them. Every one of us knows from past years' experience that in this country we have to compete each year with things that had not been heard of before. We discover a thing or buy a patent and manufacture the article and sell it, and we can sell it perhaps profitably, and make large profits on it, say for three years, and then something else crops up and the profits fall off because of the idle time in the factory. Now, what are you going to do with the idle time which follows your three years of prosperity? You say, for example, that you are going to establish a factory and build a gas engine. Then you may do that and your gas engine may be very popular, and you may get large profits for two or three years, and then you will find something in the market which will be more popular than yours, and you are idle. It does not necessarily follow that the new thing is as good as the one you manufacture. It is not absolutely necessary that it should be better, but it is new, and in the way of handling it it may prove a very successful seller. Every one of us has to prepare in some way for such an emergency, and the object of national conventions, I presume, is that we should recognize the importance of such matters and adopt some basis of putting them in the cost accounting or in some other part of the business. While it is a thing that has to be met by all of us, I cannot feel that it is a matter which we can adjust, but is one belonging to the proper management of a plant.

Mr. Segner: That is true, but still I insist that we, having met together here and discussed the matter, can determine upon a proper amount which should be reserved and which will enable us to make good progress, and this determination, this basis fixed upon by this association assembled here in convention should be recorded in our association records for the guidance of all manufacturers. Managers of shops cannot go into other establishments and factories and go through them and see what they do, because they would not permit them. Those are trade secrets which everyone has and will preserve inviolate, but at the same time there should be, in my opinion, some figure adopted by this convention as the proper amount to be charged and where it should be charged. Every one of us knows we should have a figure and it ought to be charged somewhere, and we should

have the same principle of charging it. That principle should be established. If you are charging the cost of production to the cost of selling your goods and your overhead expenses, then in my opinion there should be charged this amount, call it what you will, reserve account or whatever else, and if we fix it at 10 per cent. and decide where it properly should be charged, I believe we are doing great work for all the manufacturers, because we are furnishing them with an absolute guide as to the mode in which they conduct their business.

Mr. Roberts: What difference does it make if it is charged to the selling account or to the manufacturing account? It is true that in the operation of our business all of us know it should be charged somewhere. The proper item it seems to me to charge it against is waste time, but that is a matter for each manufacturer to decide how to charge it. While we can discuss a matter among ourselves and may perhaps agree upon the amount which it is wise to charge off, in my judgment how it should be charged off should be left to the management.

The President: It does not seem to me that there is any disagreement on the part of the members of the association that some such charge should be made, but how the charge should be made and what kind of a charge it should be is a question that we do not agree upon. Apparently none of us make such a charge. Personally I do not agree with Mr. Segner. I take the chance on that. The trend of this discussion seems to indicate that we cannot accomplish everything we desire on this line at the present time, and perhaps the better way would be to postpone the subject until the next convention.

Mr. Segner: Does anyone in this room think it is not good practice to carry a reserve for idle capital? That is what is recommended in this report. Now, if any member of the association holds that it is wrong or not good practice to carry that reserve, I should be glad to have him say so and give his reasons.

Mr. Bolens: I think you will come around to a remark I made yesterday, that it depends a good deal on the internal revenue commissioners and what they would do with such a reserve if you had one. From my experience with the internal revenue commissioners in Wisconsin, I know that they would immediately jump on us and assess you upon it, no matter how you charged it, because they will assess you on a loss if they get a chance to do it. In the light of our experience, we are willing to stick that reserve in in any way we can so as to keep it out of their sight, but if they find it in one place, then we will stick it in some other place. A gentleman with whom I am connected, a Mr. Kerr, was connected with a factory which failed, and in reorganizing the plant they charged off the indebtedness in an item by itself as a loss of \$100,000. It stood there and was an absolute loss, and yet the internal revenue commissioners assessed them for income tax on that \$100,000 which they had lost and paid,

because they said that that was the result of bad management. He put it in exactly as it was as an absolute loss, but they ruled that the law did not recognize any such item. Now, if you charged 25 per cent. in any one year, and they allow it in some states, and they allow it in this state, but in Wisconsin if you have made that same charge they will not allow it, nor will they allow us to put it in in any other way. Now, you have to keep that in mind in fixing the amount you are going to charge up, and if you can find any item by which you can charge it and have it slide by the internal revenue commissioners and escape taxation, I should say do so; otherwise you had better leave it as a surplus as it is. We have to take the rulings of the commissioners and take whatever we can get and then make the best deductions we can.

Mr. Segner: I believe the internal revenue commissioners recognize that and will allow a certain amount every year according to the capitalization of the plant.

Mr. Bolens: Then why not communicate with the internal revenue commissioners at headquarters and have it absolutely established what they will allow?

Mr. Segner: I think it is recognized by the internal revenue commissioners, as it is recognized by everyone else, that there are times when the factories are idle and that the manufacturers have to reserve for that idle capacity. For one, I am thankful I do not live in Wisconsin and have to pay such internal taxes as Mr. Bolens refers to on a dead loss. We are more fortunate perhaps in my state, but for all that it is a factory expense or a selling expense, and I do not care how you charge it, but I do hope the convention will not play with this matter year after year, but will do something this year to establish a basis and not pass it by without some effort, after the discussion we have had, to recommend and adopt a basis as the proper one for all manufacturers to adopt.

Mr. Main: One thing suggested itself to my mind in regard to how it would be allowed by the commissioners. I believe the sum of 10 per cent. would be passed by the commissioners, provided it is shown that that is a fair percentage and not a fictitious amount. If it is fictitious, or they think so, they will strike it out, but it seems to me that if it is shown to be reasonable, there would be no difficulty in getting the commissioners to pass it.

The President: In fixing a percentage of a reserve for this period of idleness, it must not be forgotten that there may be in one shop one piece of machinery which 100 per cent. may be considered reasonable, and another where it would not reach 10 per cent. Our method is to keep track of the producing capacity of a machine, and then lay aside a percentage to meet the loss if one should arise, but it seems to me you have now entered upon the question of management of an establishment and have got beyond the range of the question before you. It is a question in my mind if the convention at the

present time is in a frame of mind which will induce it to establish a basis at this meeting. We have to make our basis on the most favorable conditions, and I do not know whether this matter had better be disposed of at this meeting or postponed until next year to give time for further and full consideration.

Mr. Bolens: No matter what you may decide upon here in regard to the amount to be charged off and the way in which it shall be charged off, you have got to come down to the proportion that the federal government will permit you to charge off, and anything above that they will assess you upon. My advice to you would be to put your charge as high as you possibly can, even at 20 per cent., and then if you cannot get 20 per cent., you might get 10 per cent., but it is a good principle to work upon to make your charge just as high as your income tax if you can do it. My experience teaches me that the federal government will allow a fair percentage, and there ought to be such a reserve, but what that reserve shall be depends, to my mind, largely upon the manufacture itself, the description of the plant used and the management of that plant generally. I am happy to say that in our state we do not have any Wisconsin methods used by our commissioners, and I am very glad of it. I say again, make your charge as high as you possibly can and charge it off and then see if you can get it allowed.

Mr. Segner: The principle is one which is and must be recognized by accountants, and such a charge as I have suggested would be a proper charge and would be passed by an accountant. As I say, the only question is as to what account it should be charged. Every accountant has his own idea on that subject, and as a matter of fact, as has just been suggested, it is a matter that really strikes at the management of a plant, and the manager would say at once what his idea was, that it ought to be charged to such an account in the hope that it might slip by the eagle eye of the internal revenue commissioner and be allowed. Assuming that it is a fact, and I believe it is, that every member of this association believes in the principle, then why cannot we figure out some basis and let that go into our record as the basis on which to fix that charge? If it is the opinion of the convention to let the matter stand over for another year, I will proceed to the next item of the report.

Interest on Plant Investment

The President: Is there any discussion upon that matter? There being no objection to it, it will stand adopted by the convention.

Mr. Segner: There is one thing I would like to call attention to. The clause provides that there should be a charge made of interest on the buildings, machinery and tools. There is a difference of opinion among accountants as to the correctness of such a charge, and even among those who admit its correctness there are some who figure interest on buildings and equipment only, not on merchandise on hand, but let us realize that in any manufacturing establishment we

must necessarily have a stock of raw, semi-finished and finished material before we can begin shipping and converting our product into money. The amount thus invested is certainly entitled to earn interest the same as the balance of our investment. It is my opinion that our factory costs should be so figured that if we were to sell at flat factory cost we would still earn legal interest on our plant and material investment, assuming, of course, that we have no selling expense. I contend that we have not made any money at all until we have earned that interest, because we could simply lend the money to someone else and we would get the interest without doing any work ourselves. The matter, however, is one for discussion, and your committee would like to know the opinion of the majority of our manufacturers as to the correctness of charging interest on plant in our factory costs, and if so, whether it should also include material on hand.

The President: I will ask Mr. Bolens, if there is no objection, if under the laws of Wisconsin you make a charge for interest on the investment, how far will it go before the internal revenue commissioners?

Mr. Bolens: Well, I can answer that at once. It won't go at all, and if you are going after interest at all you have got to get it some other way. Now, it is all very well for gentlemen to congratulate themselves that they are not carrying on business under the Wisconsin rulings, but let me state this for your comfort that nearly every other state in the Union is copying the laws of Wisconsin and you will have to meet them. They will get you going and coming, and don't you forget it. In the case of your personal property, if that passes the income tax, and if they get on the books to which they can apply it, they will charge it against you as real estate. You cannot avoid it. They have so arranged taxes there that they catch you every way. They have covered the whole ground of machinery, and if you set up an engine and they have no other way of taxing it, they will tax it as part of your real estate. All machinery and implements used upon a farm will escape taxation, but when it comes to engines used in the manufacture or for other purposes they tax them as real estate and you cannot escape it.

Mr. Segner: Our recommendation is also that the factory costs be charged with the machinery, patterns and tools, and that would include all merchandise on hand.

Mr. Allen: Does that include the real estate?

Mr. Segner: Possibly. Since we made up this report I have been talking with several accountants, and have been told that it is the better practice to include all the material we have on hand, and in my opinion let it include, and it should include, the entire investment. Another thing that occurred to me is the item of patents. How are we going to carry them on the books, or what ought we to do with them?

Mr. Bolens: Permit me to give you a concrete example of the result of charging off patents. You know that patents are like the jiggers and patterns and things like that. If the business was all your own you would charge it up to expenses, and the quicker you do that the quicker the business will show the result. There is no need of paying contributions, because the federal authorities will not permit you to charge that off, and you cannot buck up against the federal authorities. One firm I know in Chicago, had \$250,000 tied up in patents, and they sold out their business and patents to a corporation incorporated in Delaware for \$1,000,000, and they charged them in as patents. The federal authorities would not allow it. Now, all they have to do is to claim for that in their own state, and the federal government will allow you to charge off 10 per cent. each year. If you charge the whole of it in any one year, you cannot get it allowed, and you cannot get any benefit from it. You cannot deceive any one. It is not a cash asset, and no bank will take it as such. Then why not leave it right there? You may not have made money the last year, but most of you are making money this year, and if you have any patent items, keep them and charge up 10 per cent. each year. That has been definitely settled.

The President: Is there any further discussion on the matter of patents?

Mr. Segner: I have never had much experience in patents. We have a patent but never figured that it was worth anything, so I do not know much about that phase of it. I think, however, that Mr. Bolens' suggestion is a very good one. When you have put a valuation on the patents, as a matter of fact patents represent nothing of value to your concern, as a matter of fact they ought to be worth what you paid for them, but we should predicate some plan as a standard by which we could charge them off in ten years.

Mr. Bolens: In my opinion your patent account ought to have nothing in it except what you might expend and would probably expend in the development or trying out of patent litigation, because in most cases patents are a source of litigation. Instead of charging say \$5,000 for patent litigation this year, or instead of charging it off as loss, charge it in the patent account at 10 per cent. each year, and then the government allows it and the state will allow it also.

Mr. Segner: Now, we come back again to our committee's report, and doubtless there will be a successor to this committee which will carry on the work you leave unfinished. There are some things, however, that I do wish this association would decide and not let it go year after year and hang over and do nothing. I recommend that the first thing that your committee should do is to make out a schedule of depreciation and reserve accounts. Manufacturers and our association know the need of uniform accounting, and the question now before you is how many are willing to enter into the work of standardizing our costs. Our plan is that we want a representative of some

firm, or some accountant who understands that business, to visit a representative number of our factories, to carefully examine their system of cost accounting, and then make to this association at its next meeting a report as to the practice in the different factories of working out their cost accounting and to submit to the association a skeleton cost accounting system. Many of our members already have good cost systems, others perhaps not so good. Most of us have good methods of collecting and tabulating cost data; we do not believe it would be advisable for anyone to make radical changes in that part of his cost system, but the method of handling fixed expenses, the rates of depreciation and the reserve accounts should all be kept the same in all our factories, and a good accountant can study our problems and conditions and recommend how we can handle such accounts so that we will all figure on the same basis and at the same time not conflict with the laws of the State of Wisconsin. We want all the manufacturers to subscribe to this matter, so that some one may be appointed to carry it out successfully, carry it out on definite lines. You cannot have this committee do it because, first, they do not have the ability or the time, and secondly, it would not be wise for them to undertake it. What we must do is to take one who is independent of all the manufacturers who can do it, for if any of you gentlemen have an accountant of known ability come to your factory to examine your cost accounting and your system you will admit him into your shops a great deal quicker than you would admit a competitor, no matter how skillful he may be, and you may feel that he will not expose any of your secrets. The man to be appointed is one who will not carry a business secret or information from one to the other. He will make the examination complete of each one and then from his schedules and notes sketch out a model of the system to be adopted. Those of you who do not need such a system will be repaid for your expenditure by the amount of good you do to some one else. I, therefore, hope that before this convention separates you will adopt this recommendation of the committee and start that work on behalf of the association.

The President: I would like to hear from some of the members in regard to this suggestion of the committee, for it seems to me vitally important. We cannot carry on this discussion much further, owing to the want of time, but I would suggest that the committee appointed for next year take up this idea and communicate with every member of the association individually, and in the meantime the secretary will have this report of the cost accounting committee printed and transmitted to you for your consideration and criticism, and I sincerely hope all of you will give it full consideration, because it is vitally important.

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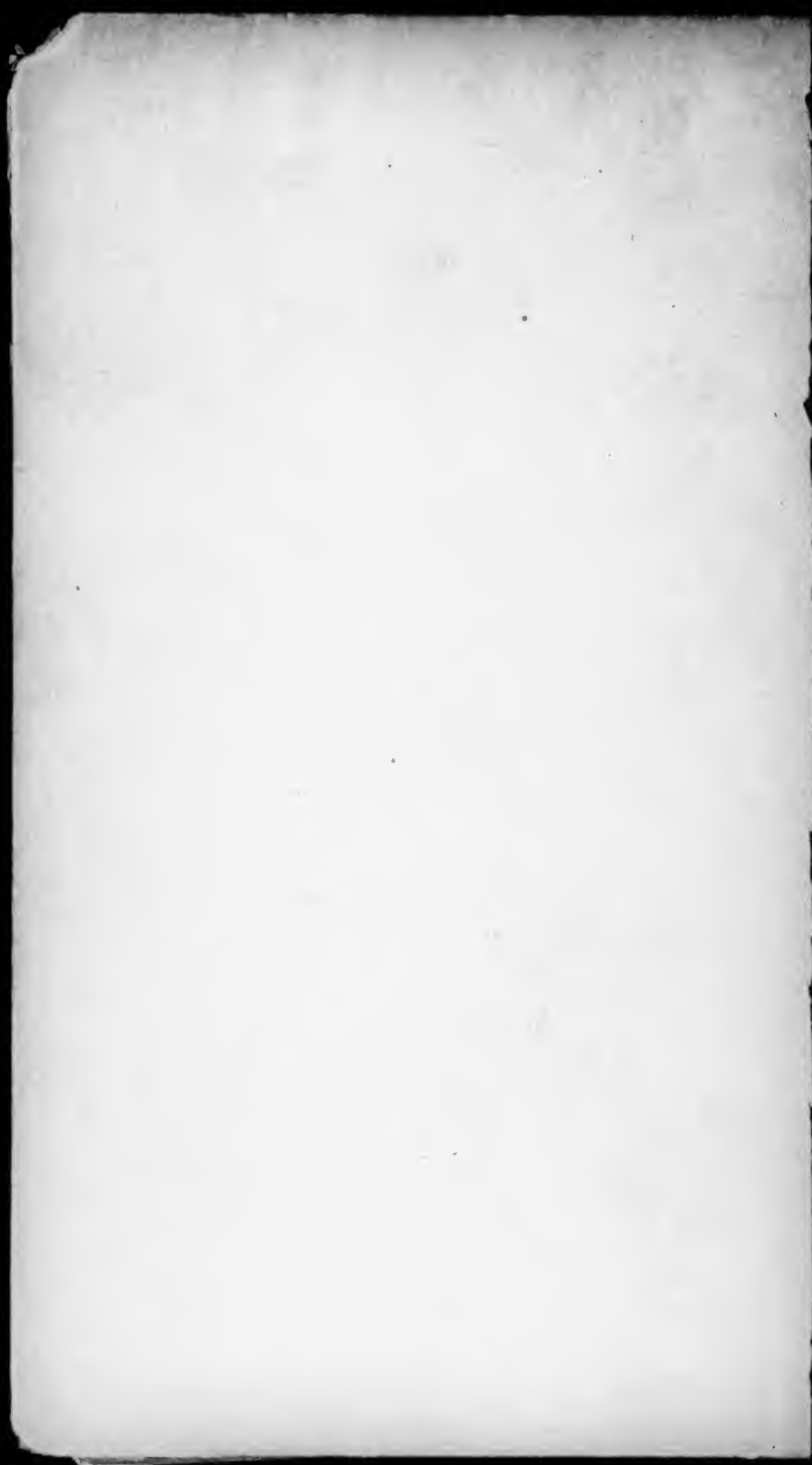
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